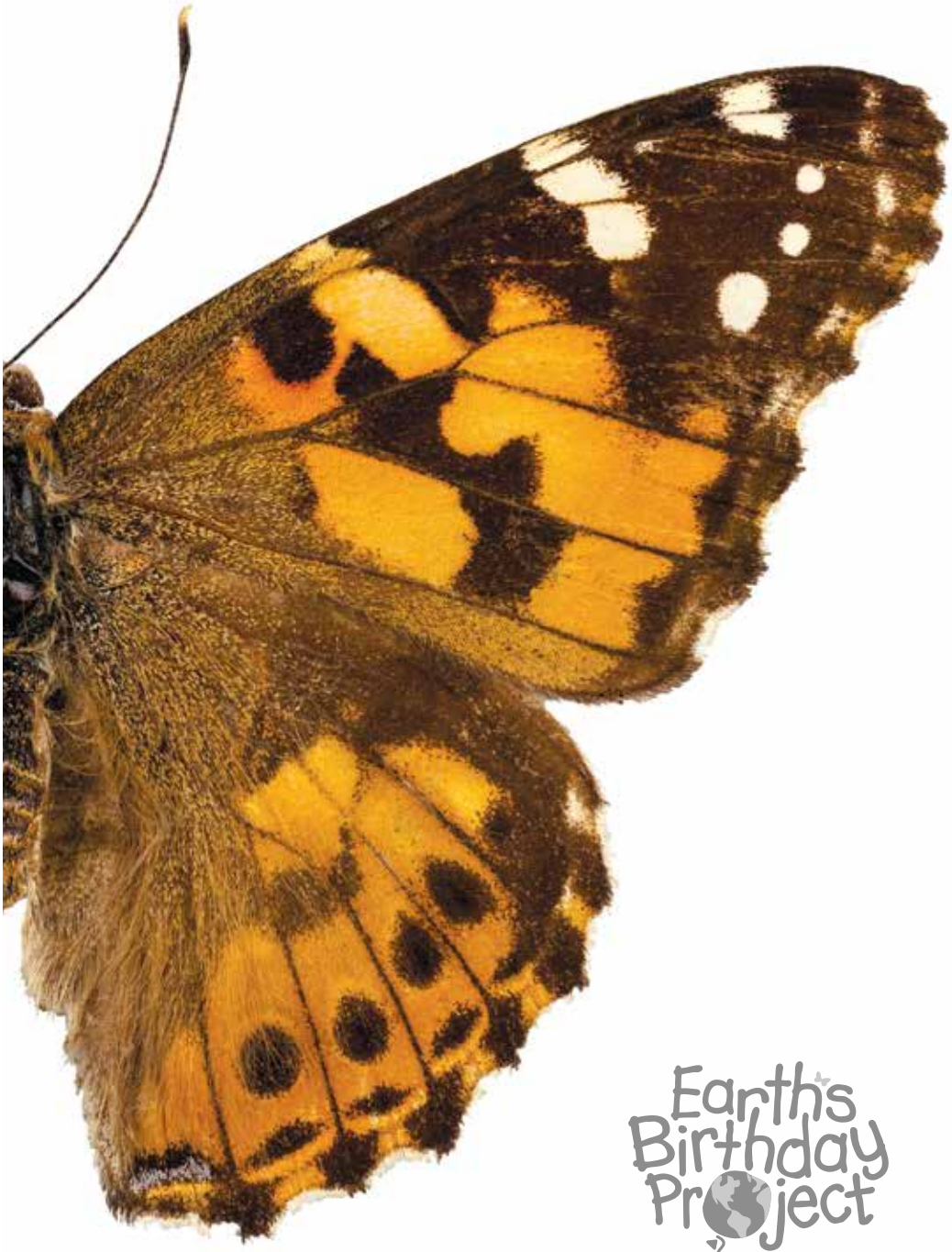
SUPER POWER SENSES, SUPER AMAZING ANATOMY

Teacher's Guide
4th Grade Science Unit



BUTTERFLY LAB

Earth's Birthday Project
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BUTTERFLY LAB

Acknowledgements

Butterfly Lab as developed through support from PNM, Los Alamos National Bank and Los Alamos National Laboratory Foundation and Carolina Biological. Earth's Birthday Project is grateful for the insights and advice of Judy Chaddick, science teacher emeritus of the Espanola Valley Schools, who helped make these science units easy, educational and fun.

Earth's Birthday Project cultivates hope for the future by inspiring wonder, learning & care of the natural world in children, teachers & parents.

Since 1989, more than 15 million children have delighted in raising butterflies, learning about the natural world & supporting conservation. Our work empowers students to initiate environmentally responsible actions in school & at home.

BUTTERFLY LAB

Contents

BUTTERFLY LAB

INTRO

Goal
Students will understand that butterflies have internal and external structures that function to support survival, growth, behavior, and reproduction. They will use models to describe how butterflies receive different types of information through their senses, process the information in their brain, and respond in a variety of ways. Based on the Next Generation Science Standards.

Objectives
Provides a hands-on, close observation of the Painted Lady butterfly. Students will:

- observe closely and record data about the caterpillars,
- learn about the caterpillar's external and internal anatomy,
- build science vocabulary through drills and games,
- discover the transformation of the chrysalis,
- read about the super sensory powers of the butterfly
- study the external and internal anatomy of the butterfly
- build and present anatomy models for an Entomology Museum

Evaluation
Handouts are a primary evaluation method. In the handouts, students will fill in diagrams, record observations and compare organisms. They will also build and present models of insect anatomy. A final essay will demonstrate how these concepts are understood.

Before Caterpillars Arrive

1. Review the Teacher's Guide
2. Check materials needed for the unit
3. Make copies of all handouts in advance

Caterpillars Have Arrived!

1. Review caterpillar care information
2. Start learning caterpillar anatomy and vocabulary
3. Play games and drill to build science vocabulary

Chrysalises Are Formed

1. Predict what is happening inside the chrysalis
2. Learn about a pupa's anatomy and transformation

Butterflies Emerge

1. Read *Super Power Senses* and take the multiple choice quiz
2. Research, build and present anatomy models for a class museum
3. Write an individual essay comparing larva & adult insect anatomy
6. Release the butterflies on a sunny day! Celebrate life on Earth!

BUTTERFLY LAB

Standards Rubric: 4th Grade

4TH GRADE	Common Core: English Language Arts Standards	Reading: Informational Text
Key Ideas and Details:		
CCSS.ELA-Literacy.RI.4.1	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.	
CCSS.ELA-Literacy.RI.4.2	Determine the main idea of a text and explain how it is supported by key details; summarize the text.	
CCSS.ELA-Literacy.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.	
Craft and Structure:		
CCSS.ELA-Literacy.RI.4.4	Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.	
CCSS.ELA-Literacy.RI.4.5	Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.	
Integration of Knowledge and Ideas:		
CCSS.ELA-Literacy.RI.4.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.	
Range of Reading and Level of Text Complexity:		
CCSS.ELA-Literacy.RI.4.10	By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4-5 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
Research to Build and Present Knowledge:		
CCSS.ELA-Literacy.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.	
CCSS.ELA-Literacy.W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	
CCSS.ELA-Literacy.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.	
Presentation of Knowledge and Ideas:		
CCSS.ELA-Literacy.SL.4.4	Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	
CCSS.ELA-Literacy.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.	
Next Generation Science Standards		
4-LS1	From Molecules to Organisms: Structures and Processes	
Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.		
LS1.A	Structure and Function: Plants and animals have both internal and exteranl structures that serve various functions in growth, survival, behavior, and reproduction.	

Caring for Caterpillars, Caring for the Earth

Children understand what it means to be a good friend. Talk with them about being a good friend. Write their suggestions on the board. How do you treat good friends? Can caterpillars, other animals and plants be our friends? Is the Earth that gives us so much - air, water, food, beauty - our friend? How might the Earth like to be treated? What can we do to help the Earth and all her creatures?

Caring for living things in the classroom is a wonderful opportunity to learn:

- **all living things have needs**
- **what are the needs of other living things**
- **how to help with the needs of others**

1 - All living things have needs.
Every child understands their own need for food, shelter and care. And every living thing also has needs. We are all connected.

2 - What are the needs of other living things.
Caring for living things teaches your students that we all have unique needs. Not everyone's needs are the same. What is good for a child might not be good for a plant. The care of a seedling is different than the care of an insect.

3 - How to help with the needs of others.
Students want to interact and be involved with the living things around them. Checking to see if plants need water or if the caterpillars are becoming chrysalises builds a child's confidence and understanding. They learn about responding to what is needed and offering to help.

Teaching Students How to Care for Caterpillars
Observing caterpillars in your classroom is a great way to teach children about the pollinators that we depend on for food. Day by day, they observe how the caterpillars grow and change. They can see them eating their food. The children can check that the cup is not in the sun. The students will learn to respect the caterpillars by not shaking or dropping the cup. This is practical experience in understanding the needs of others and learning how to help.

DID YOU KNOW?
Fun Facts About Butterflies

Impress your students! Share one fun fact a day as you progress throught the unit.

Caterpillars

- A caterpillar may have as many as 4,000 muscles in its body. The caterpillar's head has 248 individual muscles, and about 70 muscles control each body segment.
- A caterpillar will increase its body mass a 1,000 times or more before pupating.
- A caterpillar's first meal is usually its protien rich eggshell.
- A caterpillar grows so fast, its cuticle or skin becomes too tight. So it sheds the cuticle. This is called molting. Molting of the cuticle usually happens about 4-5 times.

Chrysalises

- Some butterflies overwinter inside the chrysalis and then emerges in the spring.
- The hard shell of the chrysalis is an exoskeleton.
- The exoskeleton is made of chitin, a hard substance similar to fingernails.

Butterflies

- After emerging, its wings are soft and wrinkled. A butterfly straightens its wings by pumping hemolymph (a fluid similar to blood) into its veins.
- A butterfly must assemble the 2 parts of its proboscis as soon as it emerges from the chrysalis.
- A butterfly uses its forewings to lift it into flight and its hindwings for speed and quick turning to evade predators.
- Butterflies often have brightly coloured wings with unique patterns made up of tiny scales.
- Butterfly wings are actually transparent. The colors and patterns we see are made by the reflection of the tiny scales covering them.
- Males drink from mud puddles to extract minerals that aren't available in flowers. This behavior is known as puddling.
- Female butterflies lay many eggs to insure that even a few of these eggs will survive to adulthood.
- There are about 24,000 species of butterflies. The moths are even more numerous: about 140,000 species of them were counted all over the world.

DATA & OBSERVATION

Recording Measurements & Observations Day-to-Day

20 minute introduction / 5-10 minutes day-to-day
Whole Class

Objectives
To experience wonder about the transformation of caterpillars
To practice close observation of a living organism
To involve the students in recording scientific data

Materials
Handouts: *Data & Observations Day-to-Day*
1 cup of live caterpillars

Documentation
This is a good opportunity to let the students use their interests and talents to document the insects with scientific illustrations, photographs and video. Perhaps 1 or 2 students in the class can creatively document the the anatomy and life cycle of the insect. Their visual record can be incorporated into presentations or a bulletin board about the butterflies.

1. Review Care Instructions with the Students
• Always handle the cup of caterpillars gently.
• DO NOT REMOVE THE LID. The food on the bottom of the cup is all the caterpillars need.
• There should be 4 to 6 caterpillars in the cup, ¼ to 1 inch long.
• Allow caterpillars at least 24 hours to become active. They should start growing quickly within a few days.
• Stand the cup upright at all times; keep it OUT OF DIRECT SUNLIGHT.

2. Make a Measuring Tool (one per student)
A toothpick makes a simple tool for measuring the caterpillars. Using a ruler with centimeters, a pencil and a toothpick, mark the toothpick at every 1/2 centimeter. Make 10 units on the toothpick.

Note: As the caterpillars grow, encourage the students to look for more details of the external anatomy, use new vocabulary and share those observations with the rest of the class.

DATA & OBSERVATION

Recording *continued*

3. Recording Data & Observations Day-to-Day (three students)
DO NOT TAKE OFF THE LID! Every day, one student will measure the caterpillars, a second will record the data and a third will write an observation and share this with the whole class:

- Day (for example Day 1; note that if Friday is Day 2, then Monday will be Day 5)
- Life stage of the insect as larva, pupa or adult (the stage of the majority in each cup)
- Date
- Length of the caterpillars in the cups to the nearest toothpick units
- Calculate the mode. The mode is the value that occurs most often. For example, in the sequence 6, 5, 6, 5, 5, 5, the value 5 is the mode. The mode will be used on a graph.
- Write a 1-2 sentence observation of the organism, their behavior and environment.

4. Pupation
Continue recording data and observations when the caterpillars begin to pupate. Replace the length measurement with the letter P on *Data & Observations Day-to-Day* as they become pupas one by one. When all of the insects have attached chrysalises to the top of the cup, transfer the paper with chrysalises attached into the Butterfly Cottage.

Note: if it's Friday and the entire cup have been pupas for a couple days, you should transfer the pupas to the butterfly house.

As butterflies emerge, note each one with a B on *Data & Observations Day-to-Day*.

WHAT ABOUT WEEKENDS?
For weekends or holidays, estimate length by comparing Friday and Monday data.

Data & Observations Day-to-Day

Name ______________________ Date ______________

Day ____ Stage ______________ Date ______
Length ___ ___ ___ ___ ___ ___ Mode ___

Day ____ Stage ______________ Date ______
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Data & Observations *cont'd*

Name ____________________ Date ____________

Day ____ Stage ________________ Date _______
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CATERPILLARS
Anatomy & Vocabulary Diagrams & Handouts

45 minutes
Whole Class

Objectives
To expand the students' understanding of external & internal anatomy of the insect
To increase the students' science vocabulary
To engage their sense of wonder

Materials
Handouts: *External Anatomy & Vocabulary, Internal Anatomy & Vocabulary, Fill In the Anatomy and Fill In the Caterpillar Head*

External Anatomy & Vocabulary and Internal Anatomy & Vocabulary
This 2-sided handout has labeled diagrams and vocabulary with definitions. As a class, review the anatomy and vocabulary. Emphasize the external anatomy that can be observed on the live caterpillars. Internal anatomy is primarily for information; you might encourage science oriented students to study the internal anatomy more. Ask the students if they have questions about the caterpillar's anatomy, write interesting questions on the board and discuss ways that the students can find answers to these questions and give an oral report over the next few days.

Fill In the Anatomy
This handout reinforces understanding the diagrams by having the students label external and internal body parts. Check for correct labeling and spelling.

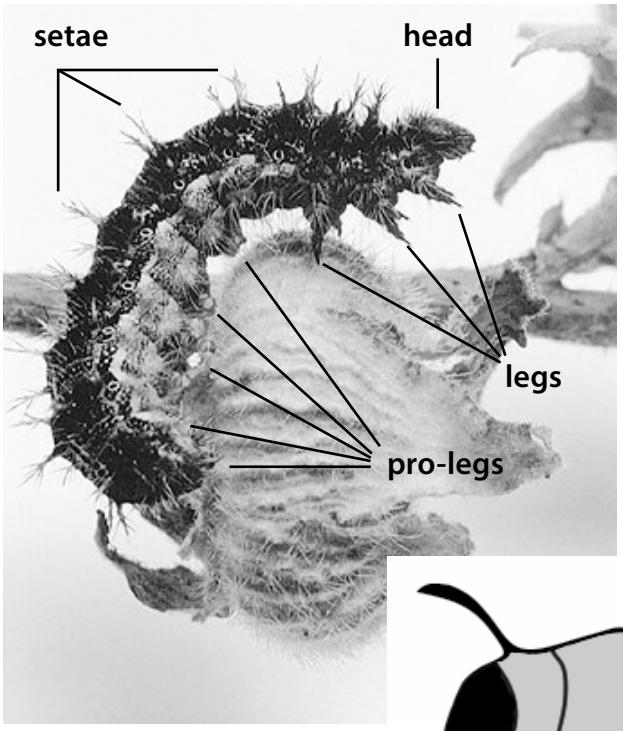
Fill In the Caterpillar Head
Students complete the details of a caterpillar's head and label 5 of the body parts.

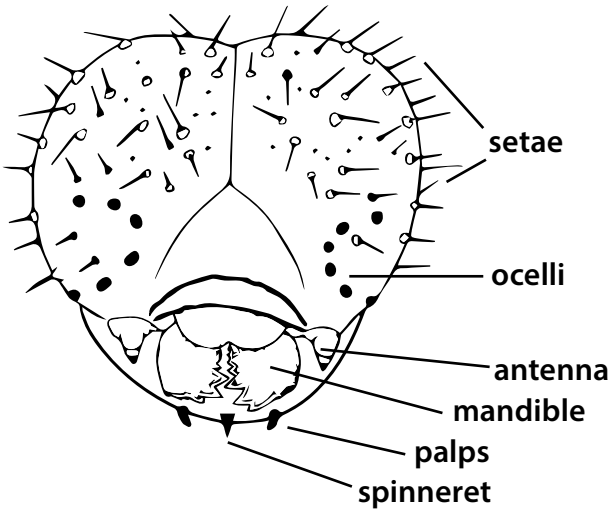
CATERPILLARS
External Anatomy & Vocabulary

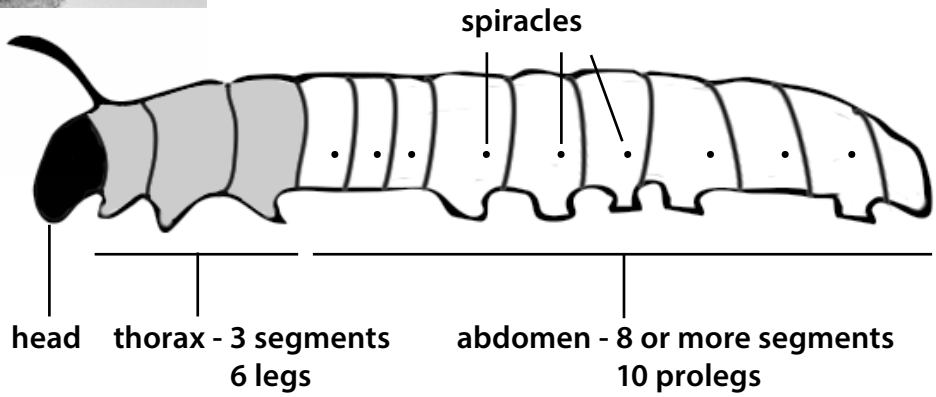
Name _____

Date _____

Caterpillar or Larva



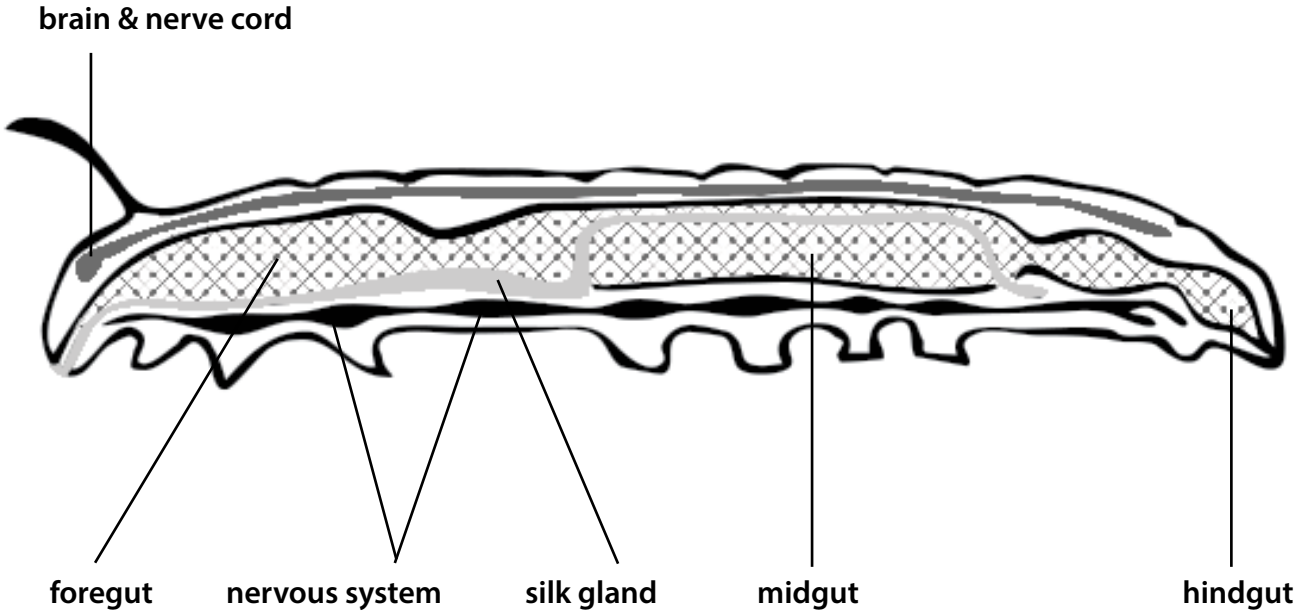




Abdomen (ab-doh-men)—the rear segment of an insect, joined to the thorax
Antennae (an-ten-ee)—a pair of organs located on the insect's head that sense taste and smell
Head—the front segment of an insect that includes the mouth, antennae and ocelli
Larva—the second stage of metamorphosis, another term for caterpillar
Legs—all insects have 6 true legs attached to the thorax
Mandibles (man-duh-bulls)—a pair of crushing mouthparts used for biting food
Ocelli (oh-sel-eye)—a simple eye that senses light and dark
Palps—parts of the insect's mouth that smells and moves food into the mouth
Prolegs—on the abdomen, they help the larva move & climb with microscopic hooks
Setae (see-tee)—hair-like bristles all over the insect's body that sense touch
Spinneret (spin-uh-ret)—an organ on the larva's head that sends out silk
Spiracles (spir-uh-kuhls)—openings along the side of its body that bring air to the cells
Thorax (thor-aks)—the middle segment of the insect where the legs are attached

CATERPILLARS
Internal Anatomy & Vocabulary

Caterpillar or Larva



Brain & nerve cord—receives sensory input from the eyes, other sensory organs in the head & the setae

Foregut—stores, grinds & moves food to the midgut
Midgut—digestive enzymes in the midgut break down food so the nutrients can be absorbed into the body
Hindgut—in the hindgut, water and salts are absorbed before waste is excreted

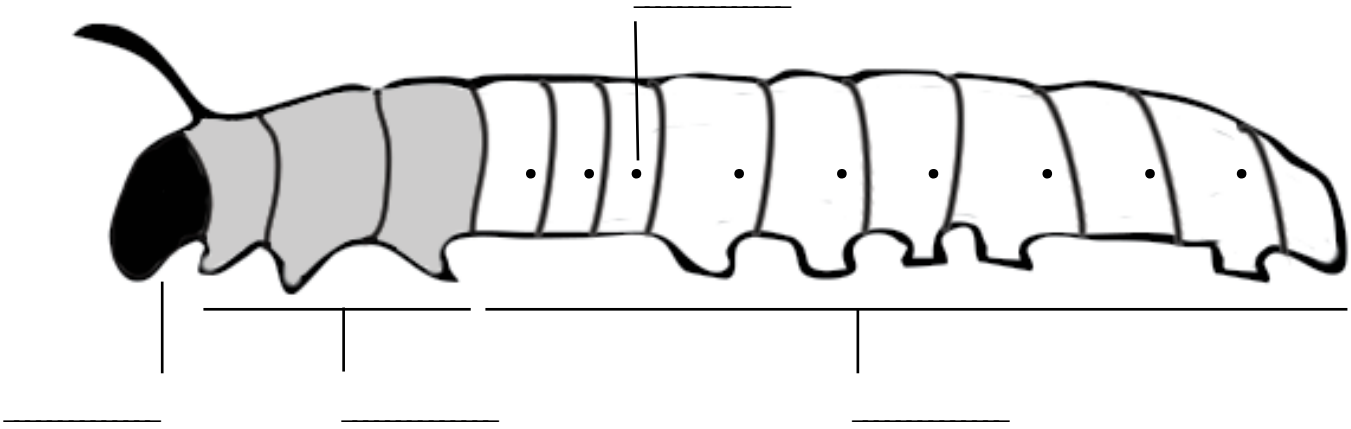
Nervous system—a chain of linked nerve cell clusters in the lower part of a larva
Silk gland—a gland in the larva that secretes a fluid that hardens into threads of silk when it comes out of the spinneret

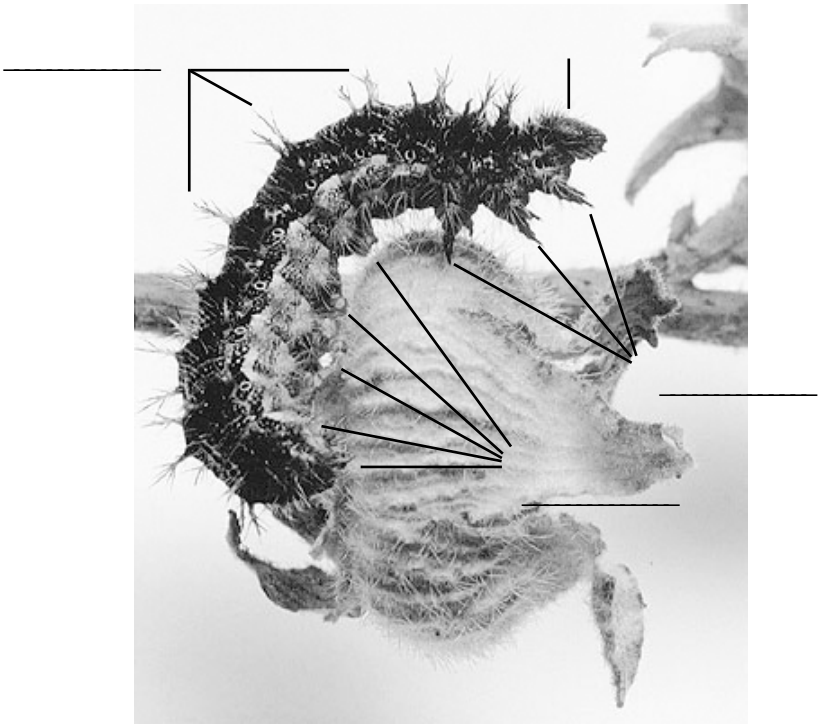
CATERPILLARS
Fill In the Anatomy

Name _____

Date _____

Label the body parts of the larva.





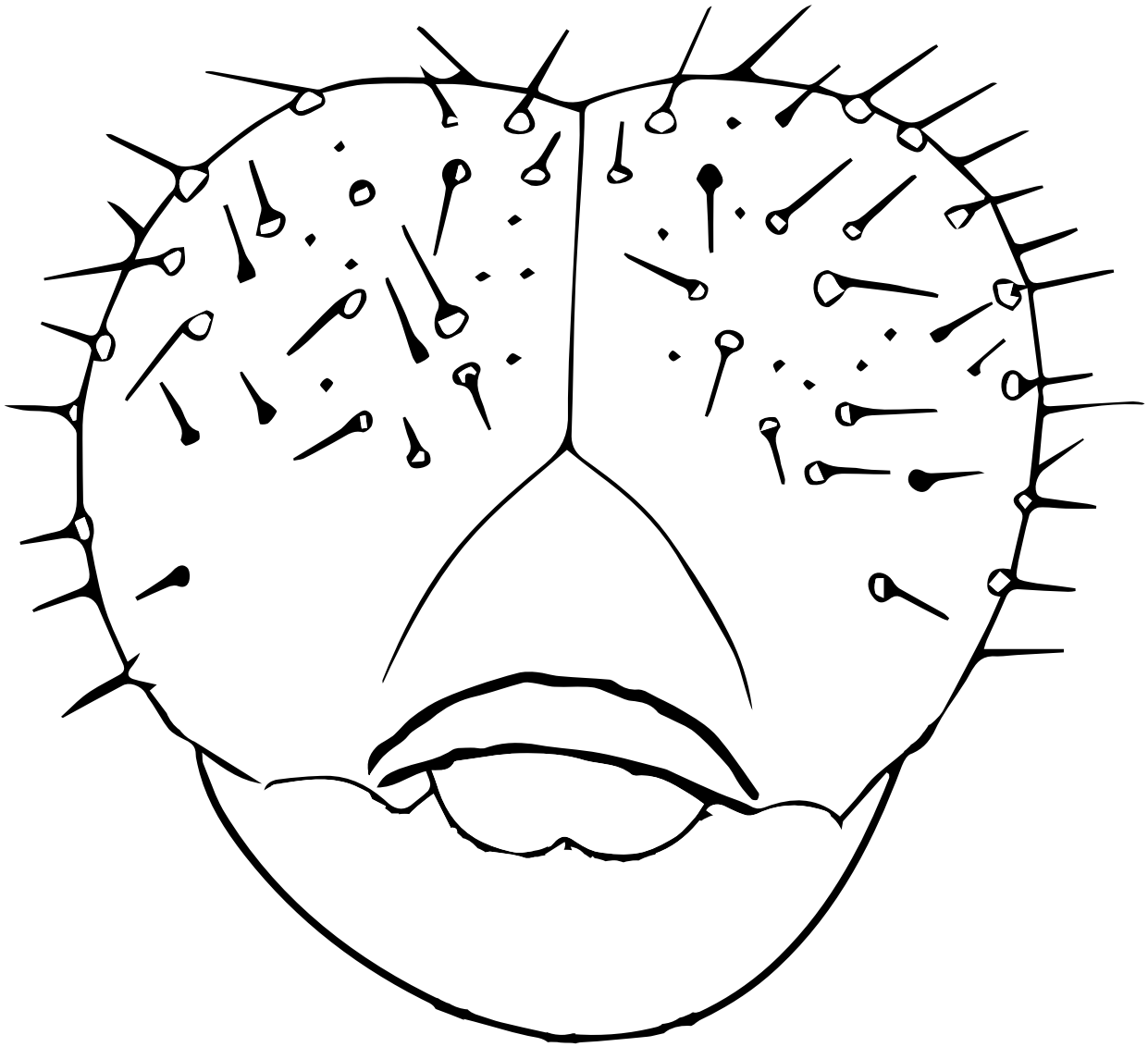
CATERPILLARS

Fill In the Caterpillar Head

Name _____

Date _____

There are five body parts missing from the caterpillar's head.
Draw the five parts in and label them.



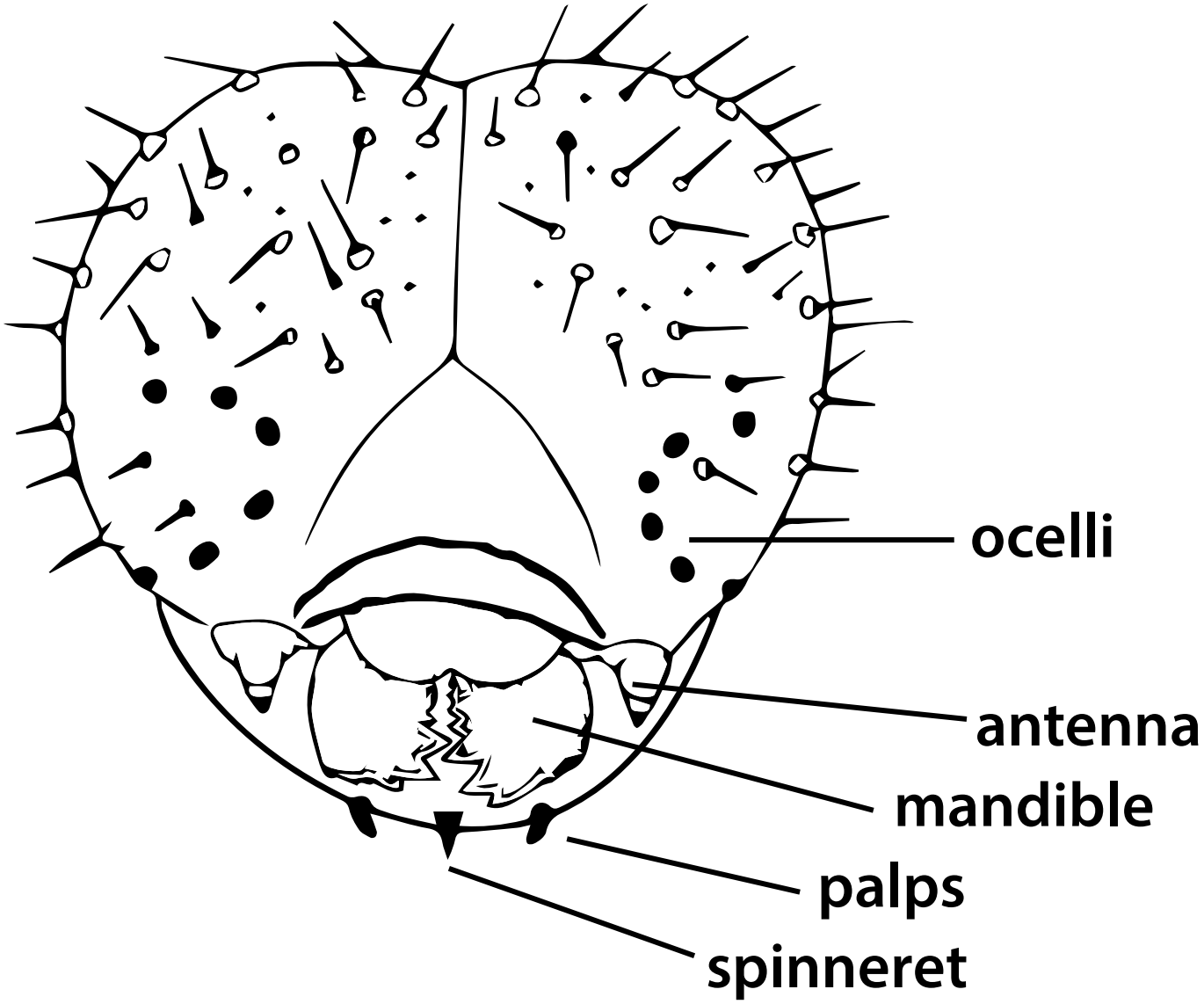
CATERPILLARS

ANSWERS: Fill In the Caterpillar Head

Name _____

Date _____

There are five body parts missing from the caterpillar's head.
Draw the five parts in and label them.



CATERPILLARS
Vocabulary Card Games

Caterpillar anatomy has a lot of new science vocabulary for the students to learn and understand. These vocabulary games should help the students work together to memorize the words, their definitions, pronunciation and spelling. If your students are already familiar with other memorization games, please use them.

Objectives
1. Students will learn the words, definitions, pronunciation and spelling of the vocabulary words.
2. Students will work cooperatively to help each other learn the vocabulary words.
3. Students will practice team work

Make Vocabulary Cards & Definition Cards
The vocabulary and definition cards are for external anatomy. For students that need a challenge, internal anatomy vocabulary and definition cards are at the end of the unit.

1. Make copies of both the vocabulary and definition cards. 2-4 sets would be useful.
2. Copy on card stock or glue onto tag board, index cards or old file folders. Separate them into sets of vocabulary cards and definition cards.
3. If there is a question about which terms match a definition, please refer to the anatomy handouts.

Pass The Card
The students and the teacher stand in a circle. The teacher starts by passing a vocabulary card to the student to the left, saying, "A caterpillar has a (vocabulary word)." The student takes the card and passes it to the next student, saying, "A caterpillar has a (vocabulary word)." The card is passed around the circle. When the card returns to the teacher, the teacher puts that card aside and passes a new vocabulary card in the same way. When the students have learned a few vocabulary words, the teacher has several options: a) when a card reaches the halfway mark, introduce a second card going in the same direction; b) introduce cards at the same time going in opposite directions; or c) send 3-4 cards around the circle in the same direction one after another. Once the game has been introduced, students can play in small groups.

Spelling Variation
The person starts by passing a vocabulary card to the student to the left, saying, "A caterpillar has a (vocabulary word)." The student takes the card and passes it to the next student while spelling the word. The third person says "A caterpillar has a (vocabulary word)." The fourth person spells the word. The card is passed around the circle.

Definition Variation
The person starts by passing a vocabulary card to the student to the left, saying, "A caterpillar has a (vocabulary word)." The student takes the card and passes it to the next student while saying the definition of the word. The third person says "A caterpillar has a (vocabulary word)." The fourth person says the definition of the word. The card is passed around the circle.

CATERPILLARS
Vocabulary Card Games

Stepping Cards
Choose 8-10 vocabulary cards and place them in a row on the whiteboard ledge. Have students stand close enough to read the cards. Everyone stamps their feet left, right, left, right, left, right in a comfortable beat. Start chanting the names of the cards. After two or three rounds, turn one card over. Repeat the chant, be sure to say the word that has been turned over. Turn over second card and start the chant again. Continue turning over cards until all but one of the cards have been turned over. Increase the pace or the number of cards if the students want a bigger challenge!

Spelling Variation
Choose 8-10 vocabulary cards and place them in a row on the whiteboard ledge. Have students stand close enough to read the cards. Everyone stamps their feet left, right, left, right, left, right in a comfortable beat. Say a word, then spell it and say the word again. “Setae-S-E-T-A-E-Setae.” Repeat with the next word and so on.

Vocabulary Relay
1. Divide the class into 2–4 teams
2. Place the sets of vocabulary cards on the whiteboard ledge, spaced apart for each team
3. Teams line up across the room in front of a set of vocabulary cards
4. Place each set of definition cards on a desk next to the front of each team

Procedure
1. The first student in line picks up a definition card and calls all the team mates together to discuss what the vocabulary word might be. When all of the team agree on the answer then the first student walks to the whiteboard and finds the correct vocabulary word to match the definition which he/she is holding
2. The student returns to the line and places the pair of cards on the desk. The next student in line repeats the procedure.
3. When all of the cards have been paired, the team members go back to their seats. The teacher checks to see if the pairs of cards were correctly matched.

abdomen

the rear segment of an insect, joined to the thorax

antennae

a pair of organs located on the insect's head that sense taste, smell and balance

head

the front segment of an insect that includes a mouth, antennae and ocelli

legs

all insects have 6 attached to the thorax

mandibles

a pair of crushing mouthparts used for biting food

ocelli

a simple eye that senses light and dark

palps

part of the insect's mouth that smells and manipulates food

prolegs

on the abdomen, they help the larva move & climb with microscopic hooks

setae

hair-like bristles all over the insect's body that sense touch

thorax

the middle segment of the insect where the legs and wings are attached

spinnaret

an organ on the larva's head that sends out silk

spiracles

openings along the side of its body that bring air to the cells

REVIEW

Knowing Vocabulary & Definitions

Name _____

Date _____

1. Caterpillars have eyes that are very different from humans.
    a. Caterpillars have 2 large compound eyes to help them see predators and find food.
    b. Caterpillars have 12 ocelli that can sense light and dark.
    c. The caterpillar's ocelli help them find food.
    d. Caterpillars have 12 eyes so their vision is very good.

2. Most caterpillars have a good sense of touch.
    a. Caterpillars feel with their feet.
    b. Caterpillars feel with their antennae.
    c. Caterpillars feel with hair-like bristles called setae.
    d. Their setae are mostly on their head.

3. Caterpillars are very good at crawling.
    a. Caterpillars have 6 legs on their thorax for crawling and holding onto leaves.
    b. Caterpillars have 5 pair of prolegs that help the abdomen hold onto leaves and stems.
    c. The prologs have microscopic hooks.
    d. All of the above are true.

4. Caterpillars eat most of the time.
    a. Caterpillars have 2 mandibles that are used to bite leaves.
    b. Caterpillars have a tongue to taste the best food.
    c. The palps are a part of the caterpillar's mouth that smells and manipulates food.
    d. Letters a and c are correct.

5. Caterpillars must breathe air to live.
    a. Caterpillars have a nose on their head for breathing.
    b. Caterpillars have many spiracles on their abdomen to bring air to the cells.
    c. Caterpillars smell with their nose.
    d. Caterpillars breathe with their mouth.

6. Caterpillars and spiders have a spinneret.
    a. The caterpillar's spinneret is located at the end of its abdomen.
    b. The caterpillar's spinneret sends out silk for making webs and sometimes a cocoon.
    c. The caterpillar's spinneret is located on its head.
    d. Letters b and c are correct.

7. Caterpillars are the larva stage of some insects.
    a. All insects have a head, thorax and abdomen.
    b. All insects have wings.
    c. All insects have spinnerets.
    d. All insects have ocelli.

REVIEW

ANSWERS: Knowing Vocabulary & Definitions

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   a. Caterpillars have a nose on their head for breathing.
   b. Caterpillars have many spiracles on their abdomen to bring air to the cells.
   c. Caterpillars smell with their nose.
   d. Caterpillars breathe with their mouth.

6. Caterpillars and spiders have a spinneret.
   a. The caterpillar's spinneret is located at the end of its abdomen.
   b. The caterpillar's spinneret sends out silk for making webs and sometimes a cocoon.
   c. The caterpillar's spinneret is located on its head.
   d. Letters b and c are correct.

7. Caterpillars are the larva stage of some insects.
   a. All insects have a head, thorax and abdomen.
   b. All insects have wings.
   c. All insects have spinnerets.
   d. All insects have ocelli.

CHRYSALISES
What's Going On Inside?

45 minutes
Whole Class

Objectives
To expand the students' understanding of insect anatomy
To increase the students' science vocabulary
To engage their sense of wonder and discovery

Materials
Handouts: *An Amazing Transformation* and *Chrysalises-External & Internal Anatomy*

When the caterpillars attach themselves to the top of the cup, they have begun to pupate. It is very mysterious that the caterpillar does exactly what it needs to do for the complete transformation of its anatomy and behavior.

Ask your students–
How does the caterpillar know when it is time to pupate?
What's going on inside the chrysalis?
How does the caterpillar metamorph into a butterfly?
How does it change shape?
How does it grow entirely different body parts like wings?

Encourage your students to imagine what the caterpillar perceives and experiences during these transformations. As a class, propose different ideas about what's happening and the mechanisms that transform the butterfly's anatomy.

How could you learn more about the chrysalis?
What methods and tools could be used to look inside?

Here are a few methods that could be used:
Dissect chrysalises at different stages of metamorphosis
X-rays could take pictures of what's inside
A tiny camera could be inserted inside
A light could be inserted inside and illuminate structures, perhaps a laser or fiber optic light

An Amazing Transformation
A science reading about anatomical structures that were recently discovered.
After the reading, have a class discussion about how scientists make discoveries.

Chrysalises-Developing Anatomy
This handout has labeled diagrams of developing anatomy. As a class, compare the anatomy of a chrysalis and a caterpillar. What is the same, and what is different?

CHRYSALISES
An Amazing Transformation

Maria Sibylla Merian (1647–1717) was a **naturalist** in Europe. She studied the butterflies in her own backyard. At the age of 13, she began drawing caterpillars and butterflies.

In her era, most people believed that insects were "born out of mud." They did not understand that caterpillars become butterflies. Merian directly observed the life cycle of butterflies. She was one of the first naturalists to do this. Merian described and illustrated 186 different insects.

Merian learned about **metamorphosis** through close observation. Another way that scientists learn about animals is through **dissection**. By dissecting or cutting open a chrysalis, scientists can see what is inside.

When a pupa is one or two days old, it looks like its muscles and organs have dissolved into mush. After at least a week, a butterfly starts to form inside.

In 2013 scientists made an amazing discovery! They tried a new way of seeing inside a chrysalis.

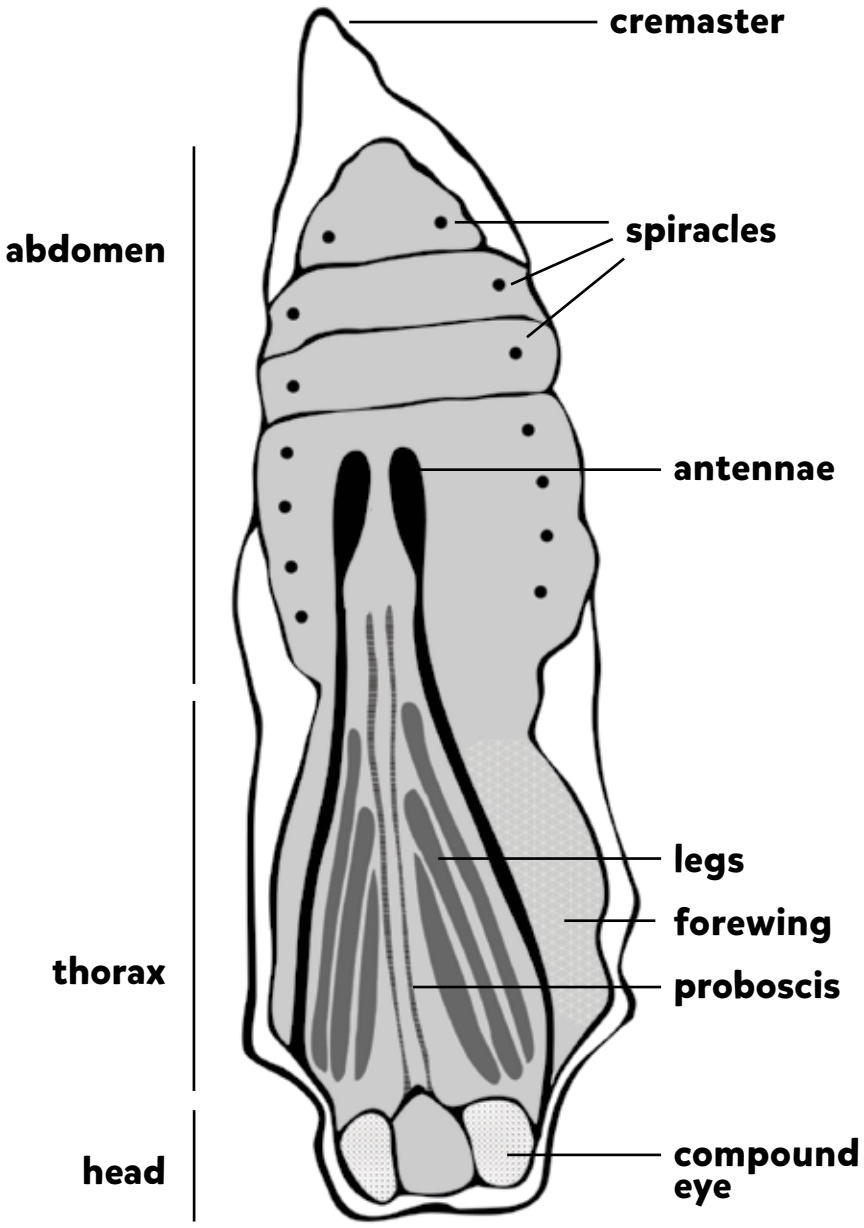
Thomas Simonsen from London's Natural History Museum put chrysalises of the painted lady butterfly into a **micro-CT scanner**. A micro-CT scanner is a special type of x-ray that takes many layers of pictures inside the body. Then a computer puts the pictures together into a 3D image.

Simonsen discovered that when a pupa is one or two days old, not everything is dissolved into mush. The guts and breathing tubes of the caterpillar are still working inside. As the pupa develops, the guts shrink and get ready to digest nectar. The breathing tubes grow larger and more dense.

Inside the chrysalis is another very important structure called **imaginal discs**. Imaginal discs first develop in the egg. Inside the chrysalis, they guide the development of the adult butterfly. Each wing, leg, antenna and all of the anatomy is guided in its growth by a pair of imaginal discs. That is an amazing transformation!

CHRYSALISES
Developing Anatomy

THE LAST DAY AS A PUPA



Cremaster (kri-mas-ter)—a set of hooks on the end of the abdomen that attaches the pupa to a silk pad

Forewings—2 wings on the front section of the thorax that allow the butterfly to fly

Proboscis (pro-bos-kis)—a feeding tube that works like a drinking straw

BUTTERFLIES
Anatomy & Vocabulary Diagrams & Handouts

45 minutes
Whole Class

Objectives
To expand the students' understanding of a butterfly's external & internal anatomy
To increase the students' science vocabulary

Materials
Handouts: *External Anatomy & Vocabulary, Internal Anatomy & Vocabulary*

External Anatomy & Vocabulary and Internal Anatomy & Vocabulary
This 2-sided handout has labeled diagrams and vocabulary with definitions. As a class, review the anatomy and vocabulary. Ask the students if they have questions about the butterfly's anatomy, write interesting questions on the board and discuss ways that the students can find answers to these questions and give an oral report over the next few days.

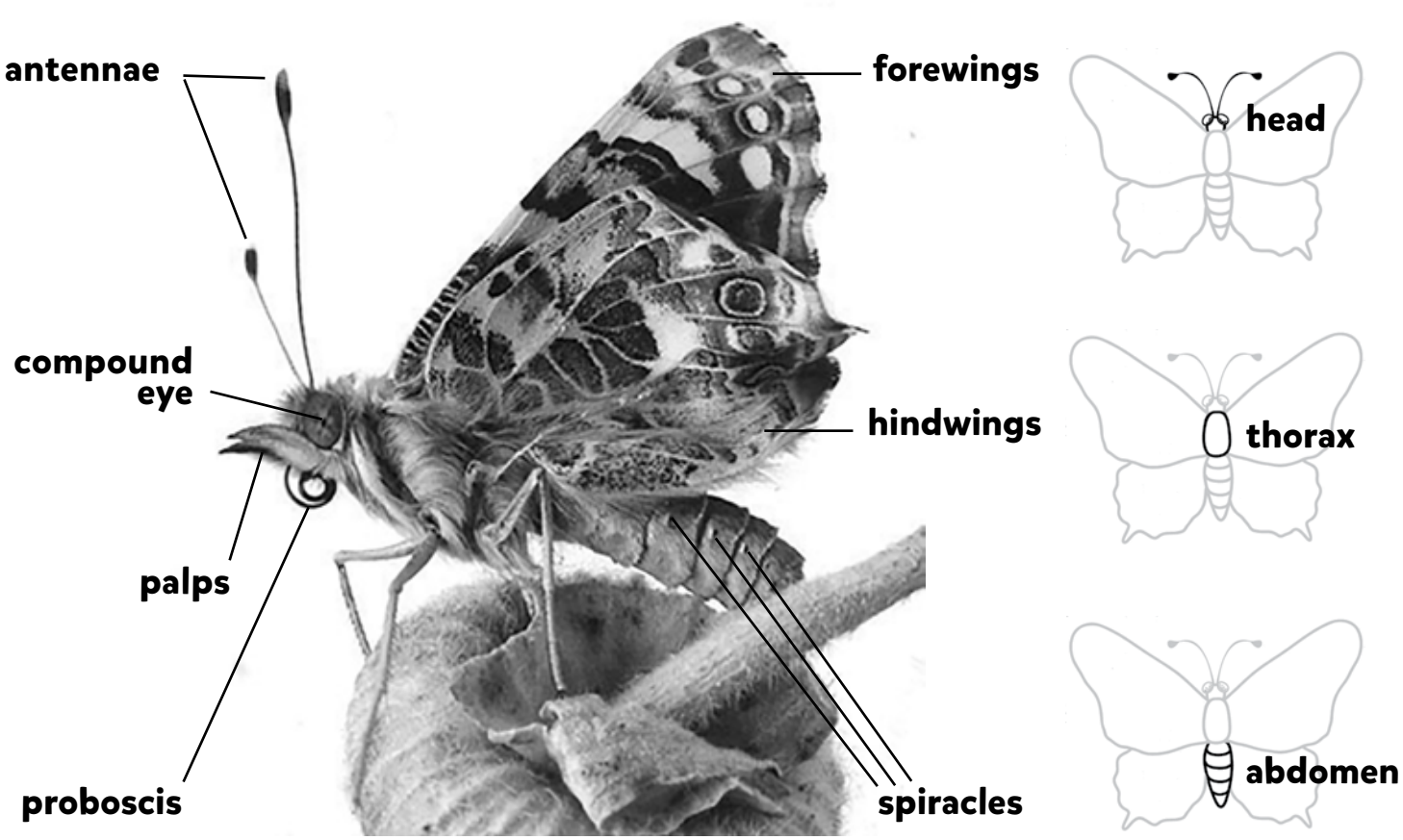
Label a Butterfly's Anatomy
This handout reinforces understanding the diagrams by having the students label external body parts. Check for correct labeling and spelling.

Compare Internal Anatomy of the Caterpillar and Butterfly
Look at the diagrams of caterpillar and butterfly anatomy as a class. Ask the students to point out what is similar and what is different. Why are some structures similar and some different? Can the different needs of the caterpillar and butterfly be an explanation?

For example
A caterpillar has mandibles for chewing leaves and a large gut to digest its food. A butterfly sips nectar with its proboscis and a smaller gut.

A caterpillar has 6 legs, as well as prolegs that are like extra legs. These help it crawl and cling to a host plant. A butterfly also has 6 legs, as well as wings to fly from flower to flower to feed on nectar and also pollinate the plants.

BUTTERFLIES
External Anatomy & Vocabulary



Abdomen—the hind seqment of the butterfly includes hearts, hindgut and other organs

Antennae—on the butterfly's head, used to taste the air and help with balance

Compound eyes—thousands of tiny lenses help the butterfly see in all directions

Forewings—2 wings on the front section of the thorax that allow the butterfly to fly

Head—the head includes the brain, proboscis, 2 antennae and 2 compound eyes

Palps—sense organs attached to the insect's mouth that are used for to smell and to move parts of the flower

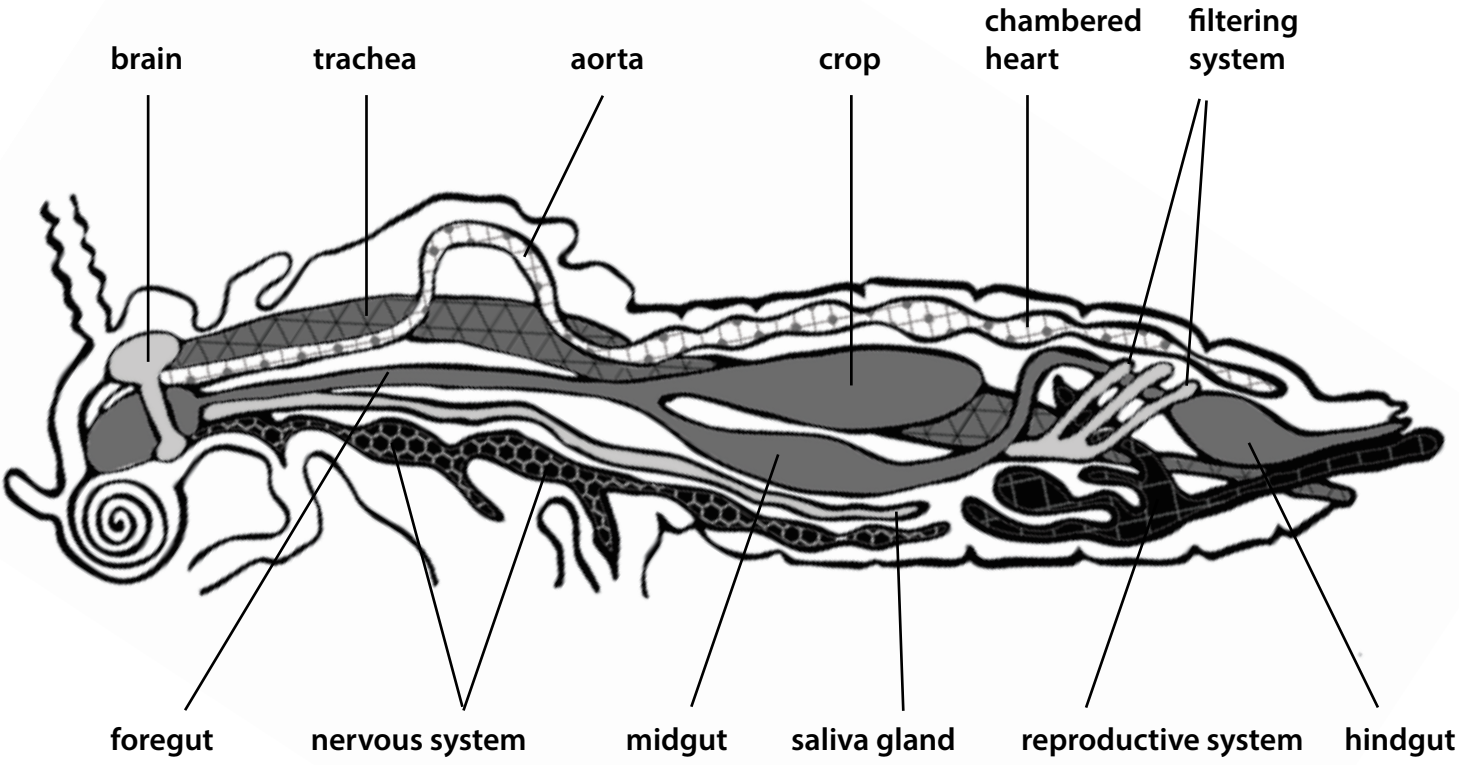
Proboscis—a feeding tube that works like a drinking straw

Thorax—the middle segment of the butterfly with 3 pairs of legs & 2 pairs of wings

Spiracles—tiny openings on the abdomen that let the butterfly breathe

Hindwings—2 wings on the rear section of the thorax that help the butterfly turn quickly

BUTTERFLIES
Internal Anatomy & Vocabulary



Aorta (a-or-ta)—In front of the heart, a simple tube called the aorta empties hemolymph into the head.

Brain—The insect brain is a cluster of nerve cells that receive sensory input from the eyes and other sensory organs in the head.

Chambered heart—A tube, sealed at one end, that beats regularly moving the hemolymph in and around the body.

Crop—Used by butterflies to temporarily store the nectar of flowers.

Filtering system—Filters and cleans the hemolymph and deposits waste into the hindgut.

Foregut—The part of the digestive system that connects the proboscis to the crop and midgut.

Hemolymph (heem-uh-limf)—A fluid in the body cavities and tissues of insects that functions like blood.

Hindgut—In the hindgut, water and salts are absorbed before waste is excreted.

Midgut—Digestive enzymes in the midgut break down food so that the nutrients can be absorbed into the insect's body.

Nervous system—A nerve cord runs along the length of the lower part of the insect's body. Butterflies are segmented animals, and each segment is controlled by its own nerve cluster.

Reproductive system—Most insects reproduce by laying eggs. The eggs are produced by the female in a pair of ovaries.

Saliva gland (suh-lie-vuh)—Brings saliva to the mouth where it dilutes the nectar.

Trachea (trey-kee-uh)—Through the spiracles, air enters the trachea then spreads throughout the body in smaller breathing tubes.

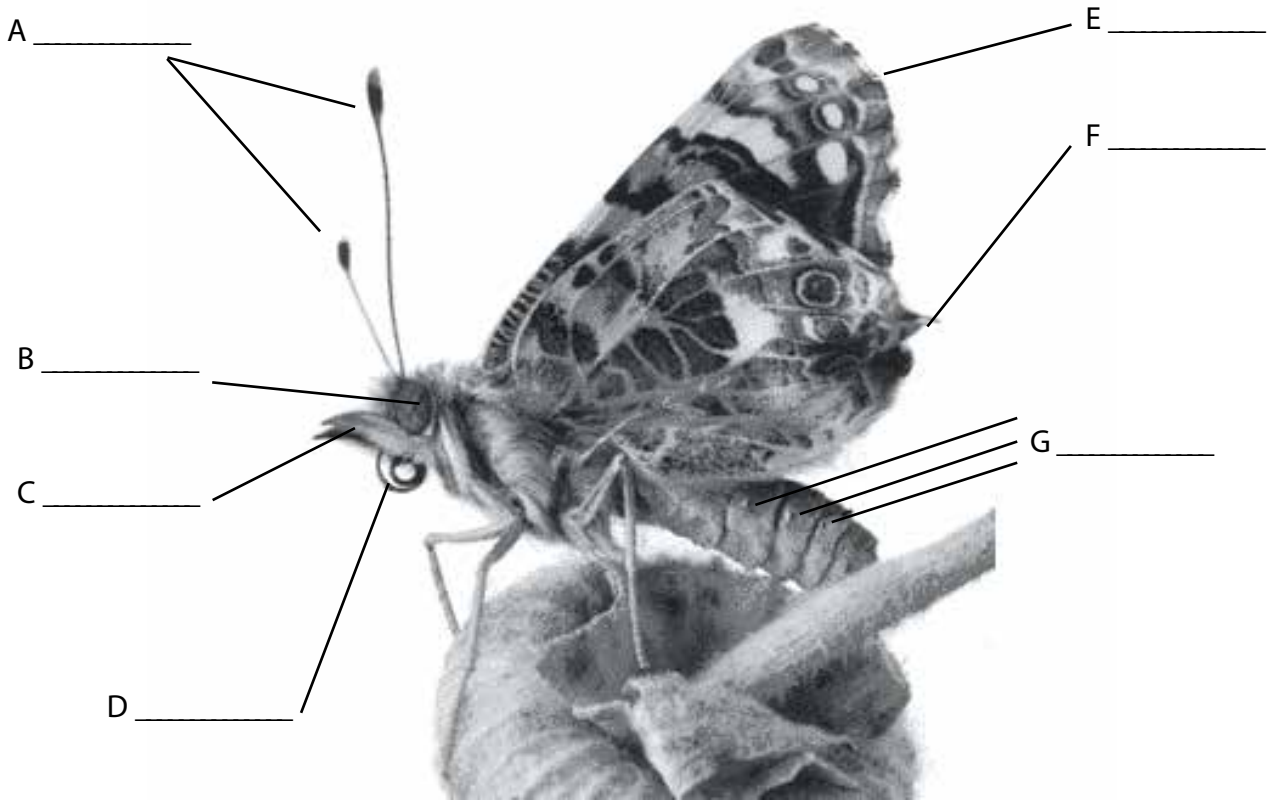
BUTTERFLIES

Label a Butterfly's Anatomy

Name _____

Date _____

Use the butterfly vocabulary and label each body part.



BUTTERFLIES

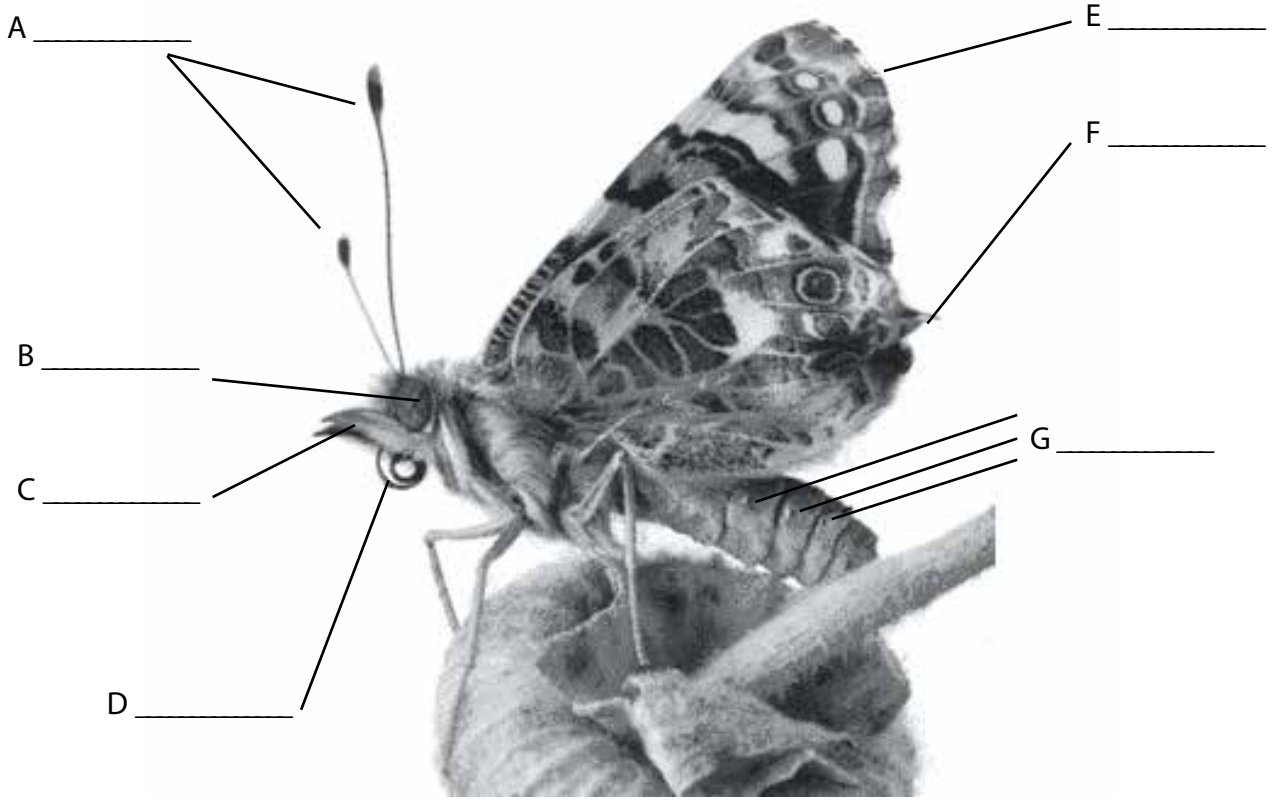
ANSWERS: Label a Butterfly's Anatomy

Name _____

Date _____

Use your butterfly vocabulary and write the correct term for each body part.

A - antennae B - compound eye C - palpi D - proboscis
E - forewing F - hindwing G - spiracles



BUTTERFLIES
Vocabulary Card Games

Continue to play vocabulary games to help the students memorize the new words, their definitions, pronunciation and spelling.

Objectives

1. Students will learn the words, definitions, pronunciation and spelling of the vocabulary words.
2. Students will work cooperatively to help each other learn the vocabulary words.
3. Students will practice team work

Make Vocabulary Cards & Definition Cards

The vocabulary and definition cards are for external anatomy. For students that need a challenge, internal anatomy vocabulary and definition cards are at the end of the unit.

1. Make copies of both the vocabulary and definition cards. 2-4 sets would be useful.
2. Copy on card stock or glue onto tag board, index cards or old file folders. Separate them into sets of vocabulary cards and definition cards.
3. If there is a question about which terms match a definition, please refer to the anatomy handouts.

compound eyes

thousands of tiny lenses help the butterfly see in all directions

forewings

2 wings on the front section of the thorax that allow the butterfly to fly

proboscis

a feeding tube that works like a drinking straw

hindwings

2 wings on the rear section of the thorax that help the butterfly turn quickly

meconium

a red fluid that butterflies and moths eject after they leave the chrysalis

cremaster

a set of hooks at the end of the abdomen that attaches the upside down pupa to a silk pad

SCIENCE READING
Butterflies Have Super Power Senses

45 minutes
Whole class

Objectives
To learn through reading comprehension about the unique features of butterfly senses

Materials

For each student
Handout: *Butterflies Have Super Power Senses*

SCIENCE READING

Butterflies Have Super Power Senses

Butterflies and humans are not like each other. But we do have some things in common. We have the same senses like sight, sound, taste, smell and touch. But we use our senses differently. The senses of a butterfly are like super powers—Super Power Senses. Let's explore how the senses of a butterfly help it to survive in its environment.

Sight is a super sense for butterflies. They have two large **compound eyes**. These eyes contain hundreds of lenses. The many lenses form a single image. Compound eyes see a very wide area. They are able to detect movements quickly. This helps them to avoid predators. Butterflies can see special colors that humans cannot see. These special colors guide them to the flowers with their favorite nectar. Butterflies also have two simple eyes, called **ocelli**. These eyes cannot focus on objects. They can only detect light and dark.

Butterflies do not have ears. They do not hear sounds the way we do. They "feel" **sound vibrations** through a special sense organ. It is located under their wings. This helps them to avoid danger, especially at night.

Butterflies eat with a **proboscis**. It works like a straw. Butterflies suck nectar from flowers and drink water. So can butterflies taste? Oh yes, they taste and smell with their feet, legs, **palps** and antennae. Isn't that strange? Their sense organs are nerve cells with **receptors** that take messages to the brain. They are like the receptors in our nose and on our tongue. Butterflies depend on their senses of taste and smell to find their favorite foods. Many caterpillars are picky eaters. They only eat one type of leaves. The female butterfly must use her super senses to find the right plant to lay her eggs on.

Butterflies have a super sense of touch. Their entire bodies are covered with tiny sensory hairs called **setae**. The setae are attached to nerve cells. The nerve cells send information to the brain when something is touched. At the base of the antennae is the **Johnston's organ**. It helps the butterfly to keep its balance when flying.

Butterflies are cold-blooded. They only live where it is warm enough. If butterflies are too cold, then they can't fly. If they get too hot, they become **dehydrated** and die. When they need to warm up, butterflies bask in the sunlight. Some butterflies shiver their wings to raise their body temperature. The most common way of cooling is to crawl into the shade.

The butterfly's super power senses are very powerful and help it to survive in its environment. Would you like to have compound eyes? Or be able to taste with your hands and feet? How would butterfly super power senses change your life?

SCIENCE READING

Name _____

Date _____

QUIZ: Super Power Senses

1. Butterflies and humans both have sensory organs.
   a. Butterflies have different senses than humans.
   b. Butterfly sense organs are located in the same places as in humans.
   c. Humans have more powerful senses than butterflies.
   d. Butterfly senses help it survive in its environment.

2. The sense of sight is very important to butterflies.
   a. Humans and butterflies have the same number of eyes.
   b. The butterfly's compound eyes have many lenses.
   c. Butterflies can see fewer colors than humans.
   d. The ocelli eyes of the butterflies see pretty pictures.

3. The butterfly's sense of hearing is different than the human's sense of hearing.
   a. Butterflies have two little ears on their head.
   b. Butterflies hear sounds through their feet.
   c. Butterflies "feel" sound vibrations with a sense organ on their wings.
   d. The butterfly's sound organ helps it mostly during the day.

4. Butterflies have many sense organs for taste and smell.
   a. Butterflies lick nectar with their tongue.
   b. Butterflies taste with their feet and antennae.
   c. Most butterflies are picky eaters.
   d. Caterpillars eat anything that is green.

5. Butterflies have a super sense of touch.
   a. Butterflies feel with their setae.
   b. The setae keep the butterfly warm.
   c. The setae are mostly on the feet.
   d. The Johnston's organ feels heat and cold.

6. Butterflies have to have the right air temperature to live.
   a. Cold blooded means that their blood will freeze.
   b. If they get too hot, butterflies won't be able to fly.
   c. Butterflies try to get into a house to get warm.
   d. To get cool, butterflies must find shade.

SCIENCE READING

KEY: Super Power Senses

1. Butterflies and humans both have sensory organs.
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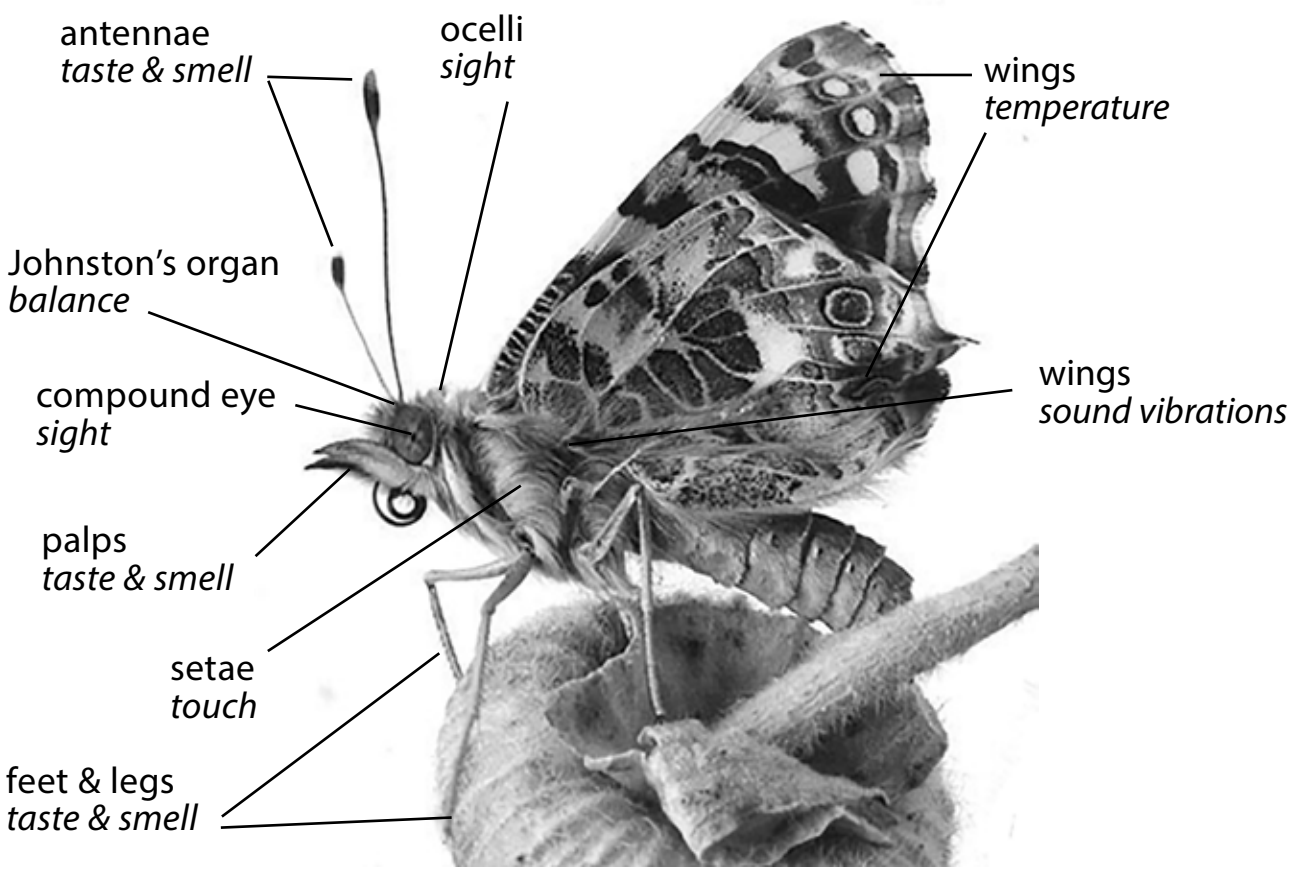
BUTTERFLIES
Butterfly Sensory Organs



Antennae—on the butterfly's head, used to taste the air and help with balance

Compound eyes—thousands of tiny lenses help the butterfly see in all directions

Feet & legs—a butterfly can taste and smell nectar with its feet and legs

Johnston's organ—at the base of the antennae, helps the butterfly balance and orient in flight

Ocelli—simple eyes that perceive light and dark

Palps—sense organs attached to the insect's mouth that are used for smell and to manipulate food

Setae—bristle-like hairs that are sensitive to touch

Wings—the wings help a butterfly sense sound vibrations and regulate its temperature

BUTTERFLIES

Comparing Sensory Organs

Name _____

Date _____

Write the sensory organs for humans on the left and for butterflies on the right.

_____ sight _____

_____ sound _____

_____ taste _____

_____ smell _____

_____ touch _____

HUMAN BUTTERFLY

BUTTERFLIES

ANSWERS: Comparing Sensory Organs

Name _____

Date _____

Write the sensory organs for humans on the left and for butterflies on the right.

HUMAN		BUTTERFLY
EYES	sight	COMPOUND EYES & OCELLI
EARS	sound	WINGS
TONGUE	taste	FEET, LEGS, PALPS, ANTENNAE
NOSE	smell	FEET, LEGS, PALPS, ANTENNAE
SKIN	touch	SETAE

RESEARCH & MODEL
Building an Entomology Museum

Multiple class sessions
Several small groups

Objectives
Students will practice team work
Conduct independent research to further their understanding
Build models to demonstrate their learning and for presention to the class

Materials
Access to the library, reference books and the internet
Construction paper, tag board, glue, staples, old magazines for construction

Directions
In groups of 2-3, the students will research **specific body parts** of the caterpillar or butterfly. Each group will build an enlarged, close-up model of a specific body part. The models should be 1-1.5 feet across and may be built with construction paper, glue, pipe cleaners, etc. The finished models will be displayed on desks and tables as if the models are part of an Entomology Museum and the small groups will give a brief presentation about the anatomy they researched, its special functions and unique features. Finally, the whole class will review vocabulary, applying the terms to the models.

Research
1. Divide the students into small groups of 2-3 students. Write each research topic on a slip of paper, if you have more than 6 groups, repeat a couple of subjects. Put the slips in a box or bag so that each group can draw a topic.

2. Tell the students that the groups will be building an Entomology Museum. Each group will research an advanced topic and build a large, close-up model of an insect body part. The models will be presented to the class and include new information and vocabulary that was learned about the butterfly's anatomy.

3. Have each group draw a topic from the bag.

Suggested topics for research and modeling:

- Caterpillar Head
- Caterpillar Mandibles & Palps
- Head, Thorax & Abdomen of a Caterpillar
- Setae of a Caterpillar on the Thorax
- 6 Butterfly Legs on the Thorax
- Head, Thorax & Abdomen of a Butterfly
- Butterfly Wings
- Butterfly Proboscis
- Butterfly Antennae
- Butterfly Compound Eyes

Building an Entomology Museum *continued*

4. Send the students to the library and/or the internet for a research session. Each student in a group should find a different reference book or website. Push the groups to find out more than they already know about their topic's anatomical structure and function. Use specific anatomical vocabulary to search on the web. Add terms like caterpillar or butterfly since many animals share anatomical vocabulary. Use 'diagram', 'close up' or 'illustration' in your search terms; images will help the students visualize their models.

5. Be sure that the students write down interesting facts and new vocabulary that they find. They will share them during their presentations. Encourage the groups to work together and decide what they will emphasize on their models.

6. Try making a prototype from scrap paper. It's a great way to figure out construction issues.

7. Build an enlarged, close up model of the topic anatomy on a cardboard base or box bottom.

8. Have each student in the group write a placard that describes the model for display in the museum. (The placard is a possible individual assessment.) The description should have a title and use at least 4 vocabulary words. Then have the group select the best placard for display with the model.

9. Take a 'tour' of the museum. At each display, the small group should give a presentation of the anatomical model, highlighting its special functions and unique features.

10. Following the tour, have the students write **positive comments** for all of the displays. Place 3 blank cards or half sheets at each display. Ask 10 students to spread out to each display and write a positive comment about something they learned from the model and presentation. Once the first group is focused, a second group can begin and so on. The comment should include at least 1 vocabulary word used in context and the student's name. When a comment is finished, turn it face down and go to another display. Each student should write 3 comments for 3 different displays.

Teacher Background
The following 2 pages have diagrams to help you guide the students as they build their models. If time is limited or the students have trouble finding good resources, you may want to share these diagrams or photos.

Online Resources for Students
http://www.enchantedlearning.com/subjects/butterfly/
http://www.biokids.umich.edu/critters/Vanessa_cardui/
http://www.learnaboutbutterflies.com/Anatomy.htm

Caterpillar Head

Use *Caterpillar: External Anatomy & Vocabulary* as a reference.

Caterpillar Mandibles & Palps

Use *Caterpillar: External Anatomy & Vocabulary* as a reference.

Head, Thorax & Abdomen of a Caterpillar

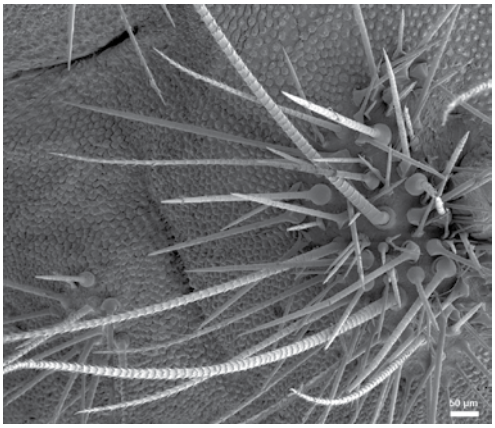
Use *Caterpillar: External Anatomy & Vocabulary* as a reference.

Head, Thorax & Abdomen of a Butterfly

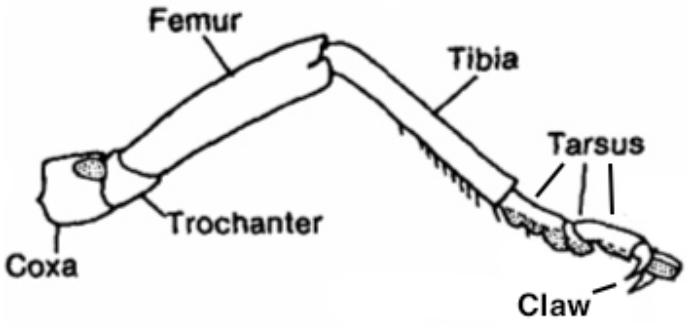
Use *Butterflies: External Anatomy & Vocabulary* as a reference.

Setae of a Caterpillar on a Segment

University of Connecticut, Bioscience Electron Microscopy Laboratory

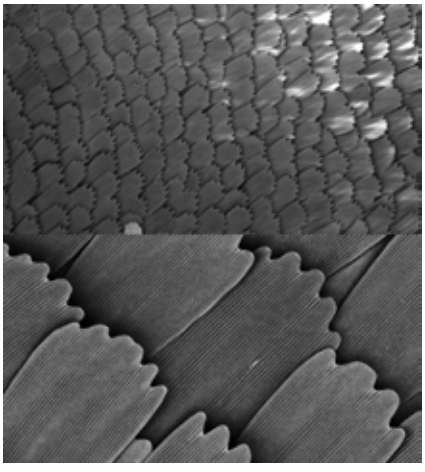


6 Butterfly Legs on the Thorax



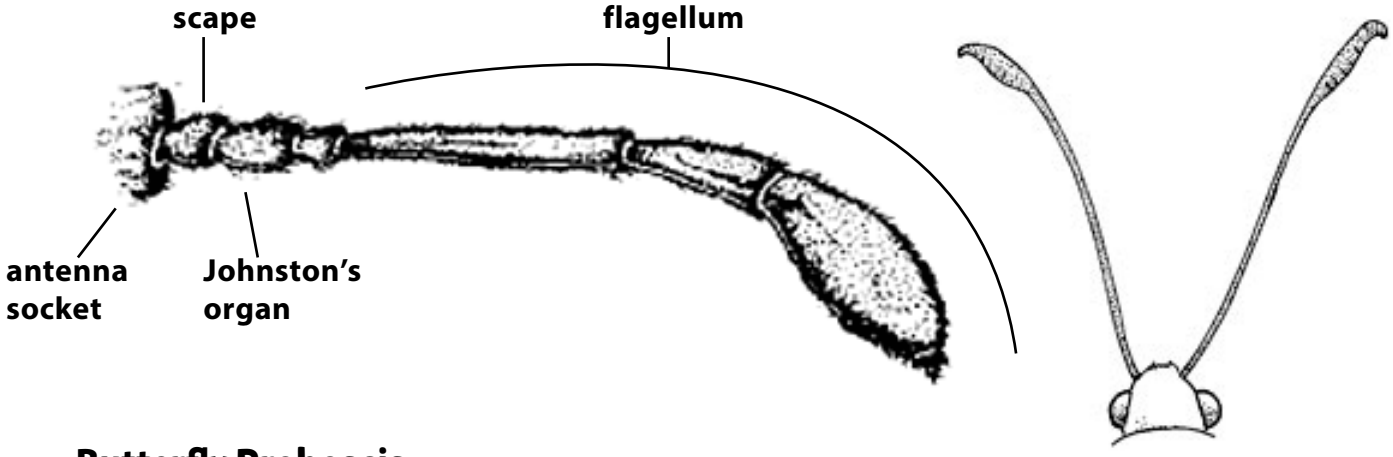
Butterfly Wings

Butterfly wings have veins and are covered in tiny, reflective scales.



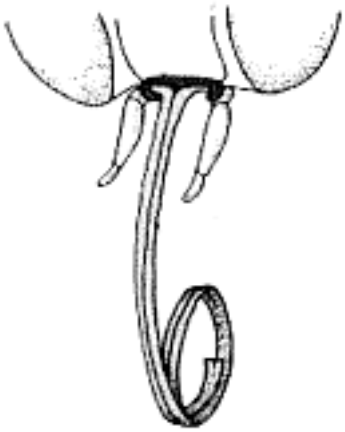
Butterfly Antennae

Butterflies have two segmented antennae with a small club at the end.



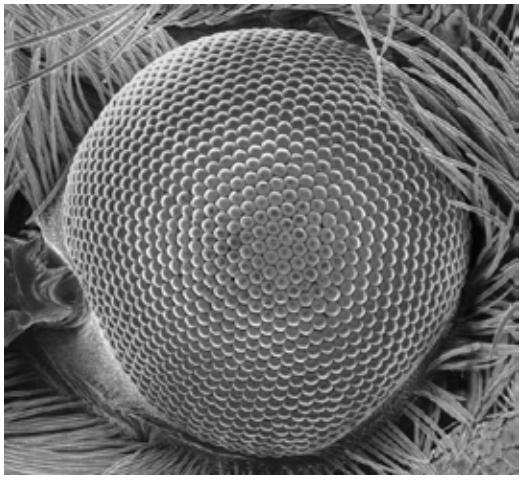
Butterfly Proboscis

In 2 parts that "zip" together to form a tube for sucking nectar. It extends for feeding and curls up at rest.



Butterfly Compound Eyes

Compound eyes are made of thousands of hexagonal lenses.



RESULTS
Analyze the Data Using a Graph

30 minutes
Whole class

Materials

For each student
Handout: *Caterpillar Rate of Growth*
Based on the skill level of your students, you may want to lead them through making the graph or have them work in small groups.

Line Graph - Caterpillar Rate of Growth

X or Horizontal axis: The horizontal axis is Days, 1 through 15.

Y or Vertical axis: The vertical axis is Units of Length, from 0 to 12. These are units from the toothpick.

Make the graph: Using the mode length recorded on *Data & Observations Day-to-Day* for Day 1, find the length along the vertical axis and the day on the horizontal axis, mark an X at the intersection. Do this for each day.

Connect all of the Xs with a line.

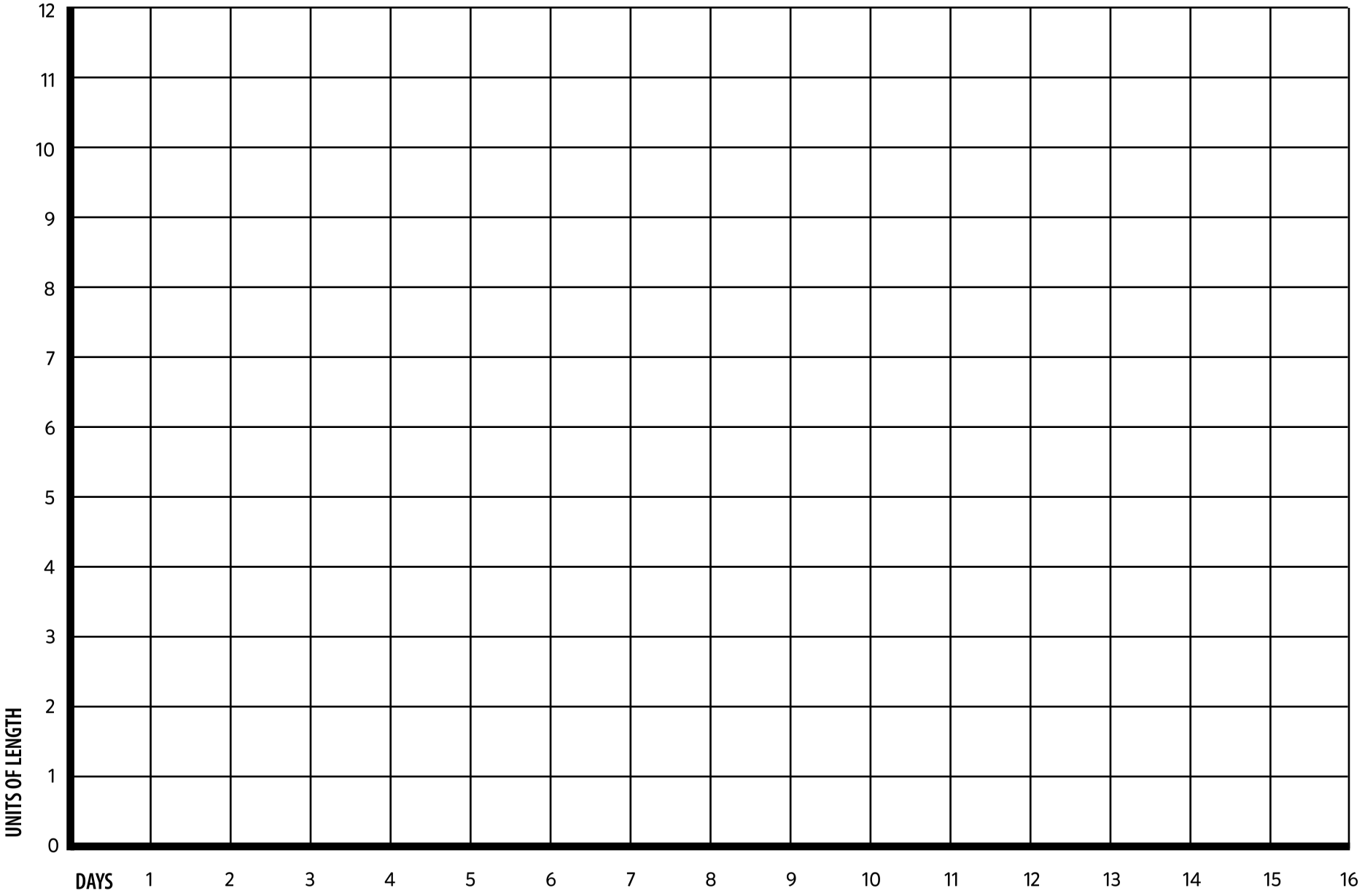
As a class, look at the *Data & Observations Day-to-Day* chart and the completed graph side by side.

Discuss the differences and how quickly or easily the data can be understood in the two forms.
What conclusions can you draw?
What does the graph tell us?
Is it a steady rate of growth?
Did the rate speed up or slow down?

Caterpillar Rate of Growth

Name _____

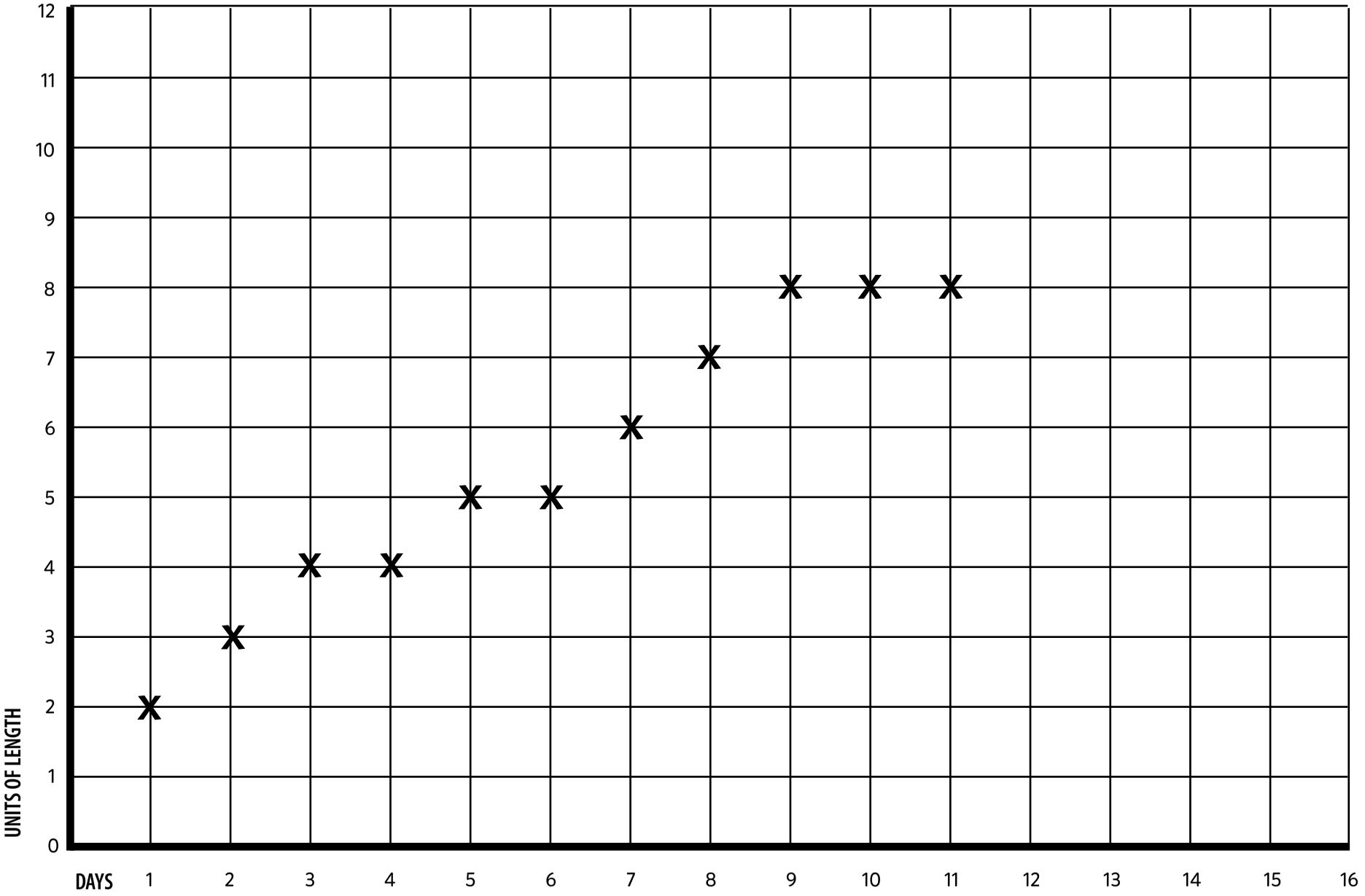
Date _____



ANSWERS: Caterpillar Rate of Growth

Name _____

Date _____



INDIVIDUAL ASSESSMENT

Comparing Caterpillar, Chrysalis & Butterfly Anatomy

As a class, look at the anatomy handouts of the caterpillar, chrysalis and butterfly. Discuss what the students see comparing the diagrams. On a white board, display the class observations in a Venn diagram.
What body parts are the same? What are different? Why?

In metamorphosis, the butterfly has gone through an amazing transformation.
How does its anatomy in each stage help the butterfly to survive in its environment?
How do its senses help it to survive?
How does its behavior change? And how does that help it survive in its environment?

Assign the students to write a creative composition comparing the anatomy of the caterpillar, chrysalis and butterfly.

The composition should be:
- A detective story that investigates the identity of 3 different bodies
- A dialog between a caterpillar and a butterfly, comparing their differences and similarities

Use at least 10 of these vocabulary words in context.
Formatting of the composition should be the same that's been used throughout the year.

- head
- thorax
- abdomen
- antennae
- legs
- setae
- prolegs
- metamorphosis
- compound eyes
- ocelli
- mandibles
- proboscis
- palps
- spiracles
- Johnston's organs

INTERNAL ANATOMY

Vocabulary & Definition Cards

brain & nerve cord

receives sensory input from the eyes, other sensory organs in the head & the setae

foregut

stores, grinds & moves food to the midgut

midgut

in this organ digestive enzymes break down food so the nutrients can be absorbed

hindgut

in this organ water and salts are absorbed before waste is excreted

nervous system

a chain of linked nerve cell clusters in the lower part of the larva

silk gland

secretes a fluid that will harden into threads of silk

chambered heart

a tube that beats regularly moving hemolymph in and around the body

crop

used for temporary storage of flowerr nectar

filtering system

cleans the hemolymph and deposits waste into the hindgut

hemolymph

a fluid in the body cavities and tissues that functions like blood

reporductive system

most insects reproduce by laying eggs

salivary gland

brings saliva to the mouth where it dilutes nectar

trachea

through the spiracles, air enters the trachea and spreads throughout the body in smaller breathing tubes

aorta

in front of the heart, a simple tube that empties hemolymph into the head

BUTTERFLY LAB

Celebrate the Earth!

Each school celebrates the Earth's Birthday a little differently, bringing their own unique ideas and interests to the event. Get creative!

Many schools choose a day close to the end of the school year, when the weather's warm, to celebrate by planting seeds, releasing butterflies and demonstrating ways to care for our home planet.

Your celebration is a special gift from the children to the Earth!

Here are some activities for your classrooms to share:

- Sharing a song that students learned in the Butterfly Lab
- Planting seeds in a school garden
- Creating an art project from recycled materials
- Releasing Painted Lady butterflies
- Students can draw pictures of their favorite animal, flower or tree
- Students reporting on ways to care for the earth like saving water, feeding birds, growing vegetables and more

At the close of your celebration, please remember to take the **Earth's Birthday Pledge**!

No job is too big,
No action too small
For the care of the Earth
Is the task of us all!

Climate Science & Butterflies

Overview
This lesson introduces the concept of climate change and how it relates to plants and insects. This lesson builds off of the students' knowledge from the Butterfly Lab by heightening their understanding of the needs of the plant and how those needs are impacted by the environment. Students will learn the meaning of climate change, and what they can do to help.

Use the script below to engage the students. Write their answers to your questions on the board.

What does a caterpillar need to survive?
- Water (Rain)
- Light (Sun)
- Food (Plants)
- Air
- Soil

What other things might affect butterflies?
- Weather (wind, rain, snow, heat)
- Extreme Weather (drought, floods, hurricanes, tornadoes, fires)
- Climate (long periods of high or low temperatures)
- Plant Bloom Period
- Pollution
- Plant Pests
- Disease

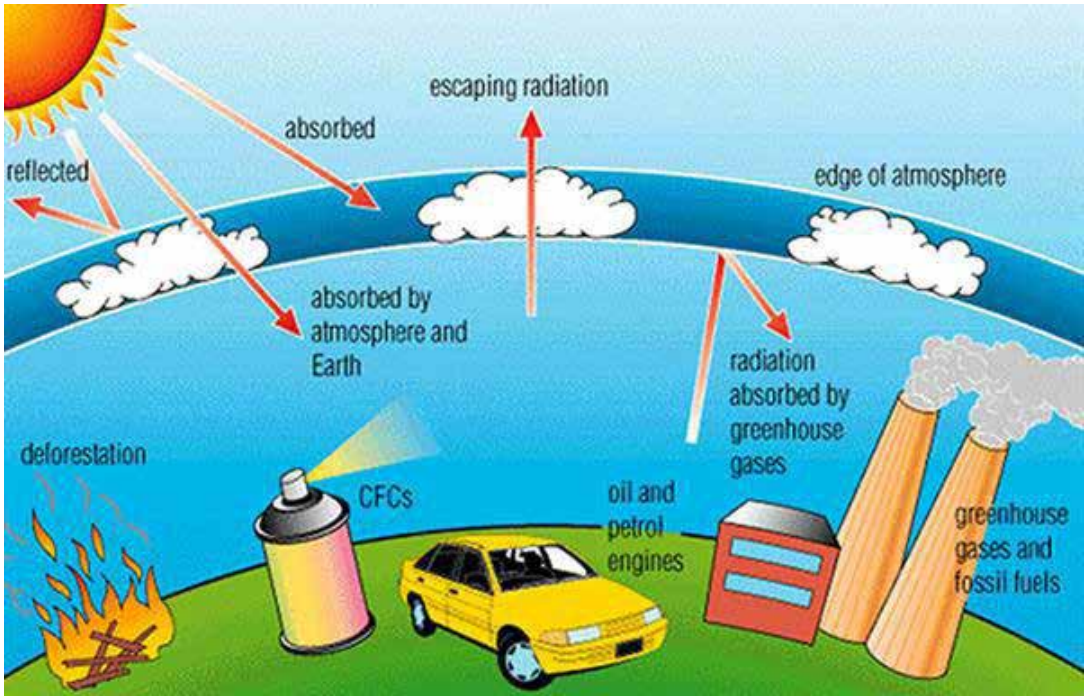
Has anyone heard of Climate Change? What is Climate Change?
Climate change is a long-term change in the average weather patterns of the entire planet. To understand this, it is important to know the difference between climate and weather. Weather is local and temporary, it's what happens at a particular time and place. Weather is rain, snow, wind, hurricanes, heat waves, etc. Climate is the big picture of weather. If an area like a desert has weather that is extremely hot with very little rain each year, it has a dry climate. If an area like a rainforest is warm and gets lots of rain, it has a tropical climate. We are seeing the average temperatures across the entire planet get higher and higher each year at a faster rate than we've ever seen before. The higher temperatures will change the climate all over the world, making dry areas dryer and wet areas wetter. We also expect climate change to cause more extreme weather events by changing the timing, frequency and duration of precipitation and unusual temperatures. This will affect the plants, animals, and humans living there.

What is causing Climate Change?
Climate change is caused by humans burning fossil fuels. Humans burn fossil fuels when we use electricity, drive our cars, fly in planes, etc. When we do these things, we release tiny molecules of pollution into the air, called greenhouse gases. There are different types of greenhouse gases, but the most common greenhouse gas is carbon dioxide (Other greenhouse gases are methane, nitrous oxide, ozone, and water vapor). Over time, these tiny, invisible molecules build up and act as a blanket over the planet that traps heat trying to escape into space. This heat trapping blanket will cause the Earth to have a fever that changes the average climate and weather of the planet.

Climate Science & Butterflies

How is climate change affecting plants?
Imagine you are a flower and you lived your whole life on a snowy mountain. You would be used to living in a cold climate, right? Now imagine that the climate of your home has changed over time to be much, much hotter. How would you like that? Do you think that might affect your life as a flower? A hotter climate might mean less water available because there is less rain or because more water will evaporate out of the soil before the plants can use it.

Many humans, like us, are lucky enough to be able to cool off by going in the shade, changing our clothes, drinking lots of water, or going into an air conditioned room. But do you think a flower can just pull out its roots and walk somewhere else? No. Flowers and many other plants and animals will struggle and have to adapt to dryer conditions to survive.

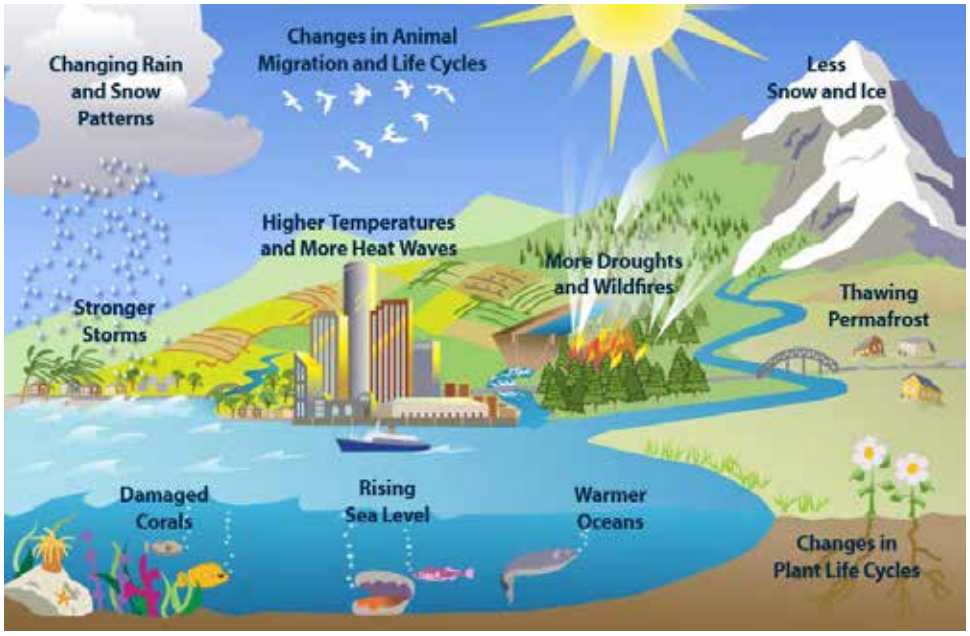


Climate change can also change the life cycle of a plant or animal all together. If the Earth's temperature is warming, flowers will bloom earlier in the year. A lot of flowers bloom in the spring time when there is less frost and warmer temperatures, but if the temperature is warmer earlier in the year the flowers will not bloom at the right time. If the life cycle of flowers is changed, it will throw other species out of their seasonal routine as well. Insects count on flowers to bloom at a certain time so they can gather nectar from the flowers, but if the flowers bloom earlier than usual, the insects might have to migrate somewhere else to find nectar.

In the Butterfly Lab, we saw that temperature affects the rate of metamorphosis in butterflies. As our climate gets warmer, this could cause butterflies to reach adulthood faster than usual and might impact their migration patterns and/or interactions with other species.

Climate Science & Butterflies

This interaction is called phenology.
Phenology is an essential aspect to life on earth. Think of it as nature's calendar that dictates the seasonal changes in plants and animals from year to year. Plants and animals count on certain patterns to take place at certain times of the year. Local climate dictates the timing of these natural events. For example, flowers bloom, birds migrate, bears hibernate, and butterflies go through metamorphosis all based on their local climate.



Phenology and Climate Change
If a local climate changes due to climate change, it will alter the natural cycle and disrupt interactions between different species. Since all species in an ecosystem are connected to each other, any increase or decrease in a species population could impact the entire ecosystem.

This could even affect humans. Farmers depend on insects to pollinate their crops. Farmers need insects to develop into adults around the same time that their crops are flowering, but a change in local climate could cause the crops to flower before the insects are old enough to pollinate them. This could impact a farmer's livelihood and our food sources.

As we can see, climate change is a big factor that can impact plants and insects. We know that it's important for us to care for our fellow humans, but it is also important for us to care for our friends, plants and animals. Can we brainstorm ideas to help save plants and animals from climate change?

Hang up the *10 Things I Can Do to Help* Poster in Your Classroom

1. Use Less Electricity
2. Save Water
3. Recycle
4. Pick Up Trash
5. Walk or Ride Your Bike
6. Choose Reusable Bags and Water Bottles
7. Eat Your Veggies
8. Grow Plants for the Bees, Butterflies, and Birds
9. Read More About Climate Change and Share What You Learn
10. Start an Earth-Friendly Project with your Friends and Family

Climate Kids in Action!

10 things I can do to help

1 USE LESS ELECTRICITY

2 SAVE WATER

3 RECYCLE

4 PICK UP TRASH

5 WALK OR RIDE YOUR BIKE

6 CHOOSE REUSABLE BAGS AND WATER BOTTLES

7 EAT YOUR VEGGIES

8 GROW PLANTS FOR THE BEES, BUTTERFLIES AND BIRDS

9 READ MORE ABOUT CLIMATE CHANGE AND SHARE WHAT YOU LEARN

10 START AN EARTH-FRIENDLY PROJECT WITH YOUR FRIENDS AND FAMILY

art • storytelling • science
climate kids

www.climatekids.org

CLIMATE SCIENCE ALLIANCE

FEEDBACK
Tell Us What You Think

Name _____

School _____

Grade _____

Please send your feedback to:
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Email :: info@EarthsBirthday.org Fax :: 505-984-9176

Thank You!