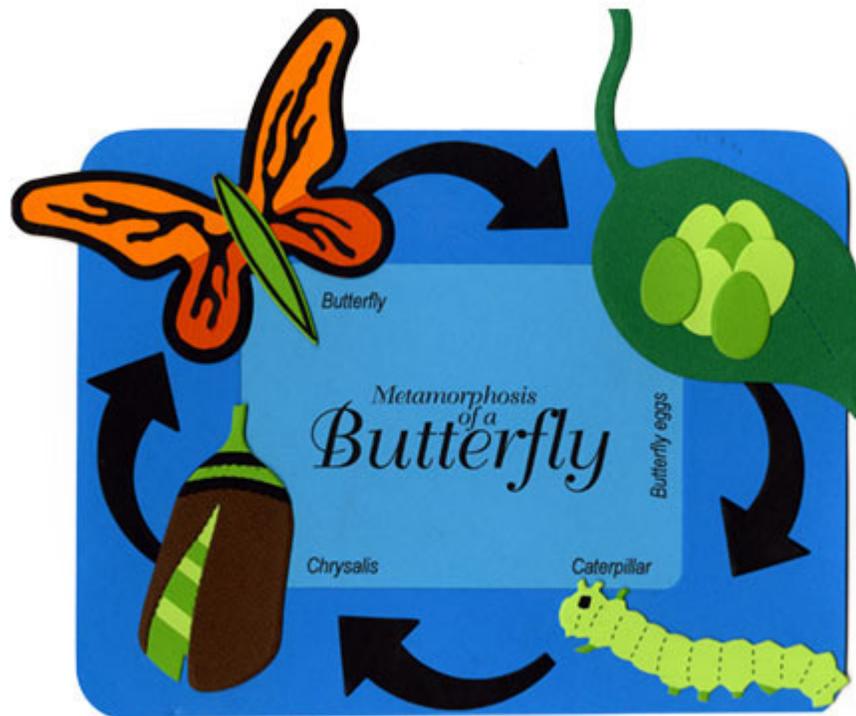


ELEMENTARY SCIENCE PROGRAM
MATH, SCIENCE & TECHNOLOGY EDUCATION

A Collection of Learning Experiences on
BUTTERFLIES AND MOTHS



Revised August 2008

TABLE OF CONTENTS

Unit Overview	2-3
Format & Background Information	3-7
Learning Experience 1 – Getting Started	8-9
Learning Experience 2 – Arrival Day	10-11
Learning Experience 3 – Larva	12-14
Learning Experience 4 – Leaves the Larvae Eat	15-16
Learning Experience 5 – Cages	17-18
Learning Experience 6 – Pupa	19-20
Learning Experience 7 – Adult	21-23
Learning Experience 8 – Stimulus – Response	24-25
Learning Experience 9 – Eggs	26-27
Learning Experience 10 – Biotic Potential	28-29
Learning Experience 11 – Life Cycle of the Butterfly	30-32
Learning Experience 12 – Butterfly or Moth	33-34
Activity Sheet for L.E. #12 – Butterfly or Moth? Answer Key	35
Activity Sheet for L.E. #12 – Venn Diagram – Answer Key	36
Butterflies and Moths Student Assessment and Answer Key	37-39
More Ideas	40-41
Inquiry & Process Skills	42
Glossary	43-44
Teacher References	45
Major Science Concepts	46-47

BUTTERFLIES AND MOTHS

GRADE 3

Unit Overview

This unit provides students with the opportunity to observe the life cycle of butterflies and moths. Although the title implies that moths will be studied, no moth larvae are sent with the unit. Methods of collecting moths and moth larvae are suggested. Students will compare and contrast the similarities and differences in the body structures of butterflies and moths. Humane treatment of animals should be stressed throughout this unit.

Scheduling

This unit may take from five to 10 weeks to complete depending upon the goals of the teacher and interests of the students. Use of the section included in this manual called More Ideas may extend the time span of this kit. For best results, this unit should be started in early fall or late spring.

Materials to be obtained locally: Please make **one** student activity book for **each** student.

paper clips	scissors
paper fasteners	small glass jar
chart paper	masking tape
mallow, thistle or hollyhock plants	box knife
plastic wrap	empty glass aquarium
water	felt-tip markers
notebooks	folders
construction paper	
cardboard boxes approximately 28 x 44 cm for butterfly cages (optional)	

*Fill honey dropper bottle with water and shake vigorously. Keep this honey and water mixture refrigerated when not in use or food will ferment. The food is fermented if: 1. It no longer smells like honey. 2. A hissing sound is noticed when the spout is opened.

Collecting

This unit can be taught successfully without students collecting butterflies or moths. However, students may want to collect butterflies, moths, caterpillars, cocoons and chrysalides. Adult butterflies can be collected using a simple collecting net made from a coat hanger and nylon mesh or cheesecloth and a wooden dowel or stick. Adult butterflies may be kept in cages similar to the ones suggested in this unit. Caterpillars may be kept in jars with lids that have air holes punched in them. Caterpillars should be provided with proper food. Adult butterflies

and moths should be released after one day since they probably won't do as well in captivity as the Painted Lady Butterflies.

Some caterpillars such as the eastern tent caterpillar and the gypsy moth caterpillars are covered with small fuzzy hairs that contain histamines that cause rashes and other allergic reactions in many people. Students should avoid handling "fuzzy" caterpillars. These caterpillars can be safely collected using a collecting jar and spoon. Also, please note that the black and brown Woolly Bear caterpillar does not have any toxic substance in its hairs.

Caution

Remind students to wash their hands after handling any of the materials in the kit.

About the Format

Each learning experience is numbered and titled. Under each title is the objective for the learning experience.

Each learning experience lists materials, preparations, evaluation strategy and vocabulary.

The evaluation strategy is for the teacher to use when judging the students' understanding of the learning experience.

Background Information

Metamorphosis is a Greek word meaning "change" or "change in form". There are several different types of metamorphosis that different insects go through.

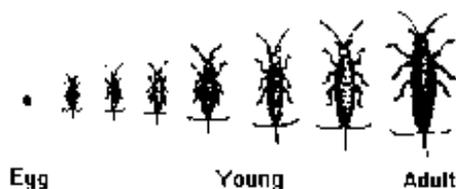
Complete metamorphosis: 4 stages – egg, larva, pupa, adult (butterfly, beetle, ant)

Incomplete metamorphosis: 3 stages – The young looks like the adult insect except the adult insect may have wings. (grasshopper, cricket, dragonfly)

No metamorphosis: Young looks like the adult only smaller.

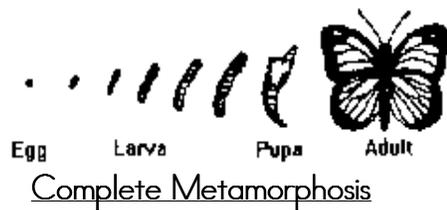
Butterflies and moths go through 4 stages of development or a complete metamorphosis.

No Metamorphosis



Incomplete Metamorphosis





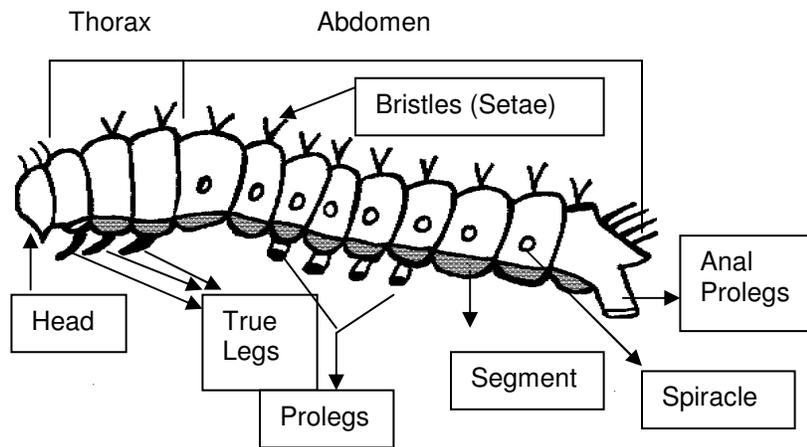
The Egg

The female butterfly can lay a few to hundreds of eggs on the plant that the offspring caterpillars eat as food. "Glue" made by the female butterfly attaches the egg to the plant leaves or stem. The eggs are covered by a membrane, similar to an eggshell for protection. Eggs are usually white and soft when laid then change color as they harden. Eggs can turn green, yellow, blue, brown or red depending on the species. The size of the eggs are about the size of a head on a pin up to one-eighth in. across. Caterpillars eat the eggshell as their first meal. It contains nutrients necessary for its proper growth.

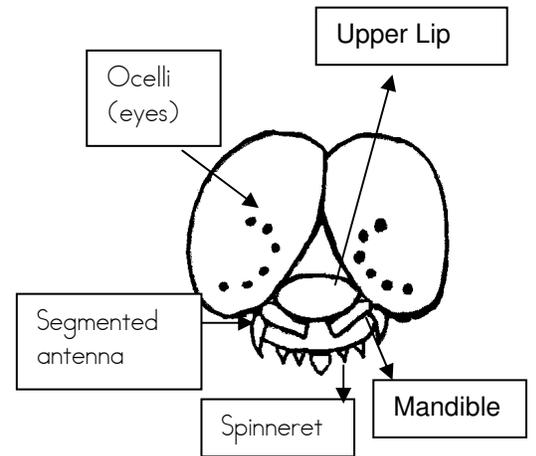
The Larva

The purpose of the caterpillar or larva stage is to eat, grow and gather the energy needed to transform into an adult butterfly. The larva stage of the painted lady lasts two to three weeks. The higher the temperature and the greater availability of food, the faster they will grow. As it grows, it will *molt* or shed its skin. The caterpillar will usually molt four to six times. The skin is the exoskeleton of the larva. When the caterpillar molts the skin, the back of its head splits first then continues down the segments of the caterpillar. Once the skin is free, it will pull itself out of its old skin. The new skin will be soft so the caterpillar can grow, however, the new skin will then harden again once the growth spurt has passed.

The larva is a worm-like creature that has three parts to its body – head, thorax and abdomen. Thorax and abdomen take up 12–14 segments of its body. The caterpillar moves its segments by contracting muscles in each segment and forcing blood forward to stretch out its body. The thorax is three segments. Each segment has a pair of legs and a sharp claw for gripping. Only the front three legs are true legs used to grasp objects. The abdomen is 9–11 segments. The final two segments are fused together. The third, fourth, fifth and sixth segments contain *prolegs* that help the caterpillar cling to objects with thousands of tiny hooks. These hooks also help with walking on different surfaces. *Spiracles* are breathing holes on the side of each segment except the second and third thoracic segment. These spiracles are attached to tracheas inside the caterpillar's body where air is transferred to the cells in the caterpillar's body. The *setae* or bristles on top of the caterpillar's body act as protection and camouflage from predators. The head of the caterpillar has two antennae, 10–12 eyes (ocelli) and mouth parts. The eyes only tell the caterpillar whether it is night or day out and some basic colors. It cannot see defined shapes.



CATERPILLAR ANATOMY



CATERPILLAR HEAD

The Pupa

Beneath the caterpillar's skin, the chrysalis is forming. Chrysalis is a Greek word for "gold" referring to the gold spots on many of the chrysalis. After the final molting, the caterpillar will stop eating and will spin a silk pad on a safe surface with its spinneret. The spinneret is located in the front, center of the caterpillar's head. The caterpillar will grasp the silk pad with its anal prolegs on its last segment. The caterpillar will hang upside down from the silk pad, its skin will split again (final molt), and the chrysalis will break free. As this is occurring, the prolegs attachment is replaced by a stem called a *cremaster*. The cremaster has hooks that will ensure secure attachment to the silk pad. The chrysalis will harden over time, and it may wiggle with the developing butterfly inside it. Old caterpillar tissues are being reformed into the cells, tissues and organs of an adult butterfly. Fat cells are changed into the hues of color for the wings. A digestive tract is formed that can only digest flower nectar. Once the butterfly has developed, its features and wing colors may show through the surface of the chrysalis. This darkened chrysalis indicates the butterfly is ready to emerge.

The Adult

The adult Painted Lady Butterfly will hatch from the chrysalis in seven to 10 days. The skin of the chrysalis is broken by the butterfly, and it crawls out. As the blood is pumped into the butterfly wings, the wings iron out and the body becomes smaller. *Meconium* comes from the intestines of the butterfly. The meconium is the unneeded fluid from the larva stage and is red in color. As students observe this occurring, some may be alarmed in thinking this red liquid is blood.

The life span of the butterfly is about two weeks.

The main body parts of the adult insect are the head, thorax and abdomen.

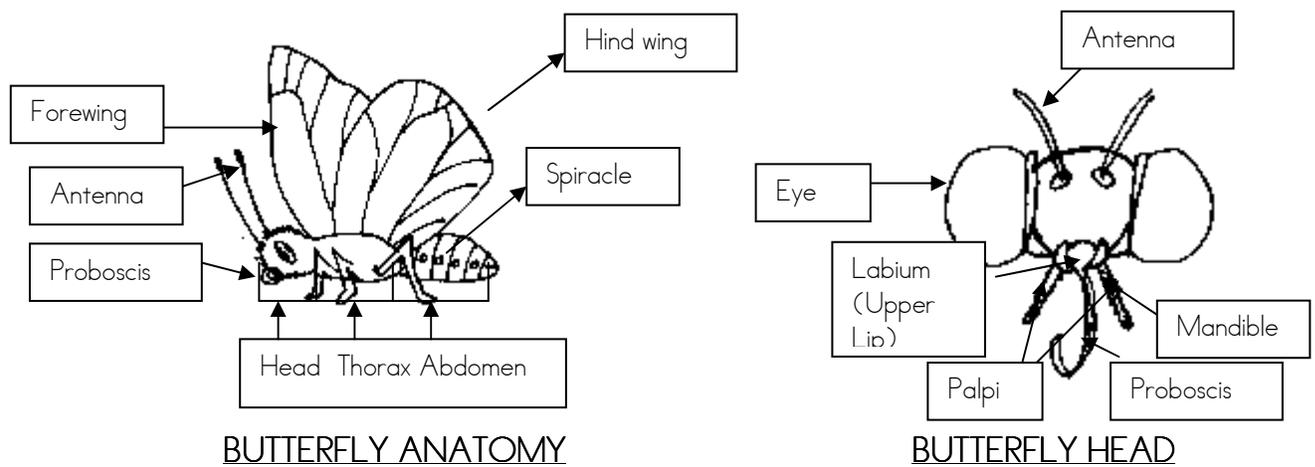
Where the caterpillar eyes could only see shapes, the butterfly's eyes have excellent, defined vision. Its eyes are large and compound, made up of thousands of lenses. Butterflies can see motion, shapes and colors. This is helpful in locating flowers.

The proboscis is the butterfly's mouth. It uses the proboscis as a straw to drink nectar from plants or juice from fruit. The proboscis is coiled up until the butterfly is ready to use it.

The antennae are found between the eyes and act like a nose and tongue combination. Some believe the antennae are used for balance and to familiarize the butterfly with its surroundings.

The thorax acts as a muscle to move the legs and wings. It has four wings, two on each side. Scales of different shapes and sizes are attached to the wings. The scales produce the color on the butterfly's wings.

The abdomen is the softest part of the butterfly body. It contains ten segments. It has three pairs of legs divided into five parts. At the end of the leg are tiny spurs that allow the butterfly to grab onto flowers. Taste sensors on the butterfly legs are very sensitive. The breathing spiracles are still part of the butterfly's body and are found in the last three segments of its abdomen.



The purpose of the adult butterflies is to reproduce. The adult butterflies will die shortly after they mate and the female lays the eggs.

On the Painted Lady Butterflies, there are no special markings to help identify its gender. The way to distinguish the female from the male is to observe the female laying her eggs. On some butterfly species, the male butterfly can be identified by the colors or markings on its

wings. These markings are different than the females.

Some refer to this species of butterfly as the "thistle butterfly" due to its fondness for this plant. It is found wherever thistle plants grow (Europe, Asia, Africa (except dense jungles), North America, South America, Australia and on many of the Pacific Islands). "Cosmopolite" is another name because it is found everywhere. It is probably the most widespread butterfly known.

Butterflies	vs.	Moth
Most are diurnal (active during the day)		Most are nocturnal (active at night)
Hold wings up at rest		Hold wings across body at rest
Clubbed antennae		Feathered antennae
Form a chrysalis		Spin a cocoon
Long, thin bodies		Thick bodies

The book, Learning About Butterflies by Carolyn Klass and Robert Dirig is an in-depth reference book that may be helpful in teaching this unit. This book is provided in your kit.

Learning Experience 1: Getting Started

Objective: Students will demonstrate an understanding of the care and handling of the butterfly larvae according to the plan developed.

Materials:

For the class:

Butterfly larvae coupon

Video–“Butterflies” (27 min.)

Chart paper*

Felt–tip markers*

Notebooks*

Folders*

Butterflies and Caterpillars by Melvin and Gilda Berger

*provided by teacher

Preparation:

When you are ready for the larvae to be sent to your classroom, **send the coupon that is in the kit** to the company. Allow **two to three weeks** for delivery. Notify the school office that you will be receiving live, perishable materials and that you should be notified as soon as they arrive. Each student should obtain a notebook and folder with pockets to hold their activity sheets for this unit. Conduct this lesson several days before the butterfly larvae arrive. See “Collecting” on pages 2 and 3.

Assessment:

Students will contribute to the KWHL chart and demonstrate positive attitude and humane treatment toward living things.

Vocabulary:

humane

care

respect

handling

Learning Activities:

Session 1:

Using the KWHL Strategy, students will explore their knowledge about butterflies and then expand on it throughout the unit. Brainstorm all that the students already **know** about butterflies. Record their ideas on a class–size KWHL chart. Ask students what more they

would like to know concerning butterflies and moths, and record their ideas under the "want to know" column. Now that the students have decided what they want to know, they need to think about "how they are going to find out" the answers to the questions they have. After the hands-on activities, maintaining journals and discussions, students can then record information into the "what we learned and still want to learn" column. This process can also be done in cooperative groups where students gather information in small groups and share with the class.

KWHL Strategy			
What we know	What we want to know	How are we going to find out	What we learned and still want to learn

Discuss care and handling of the butterfly larvae. Emphasize how delicate the larvae, chrysalides and adult butterflies are.

As a class, brainstorm a list of rules on chart paper concerning the humane treatment of butterflies. Use the sample list below as a guide.

HUMANE TREATMENT OF BUTTERFLIES

1. Treat a butterfly as you would another living creature.
2. Butterflies are not to be picked up or handled.
3. Handle the butterfly containers carefully.
4. Keep the butterfly containers clean.

Show the video Butterfly (27 min.) and/or read the book Butterflies and Caterpillars by Melvin and Gilda Berger as an introduction to future learning experiences.

Learning Experience 2: Arrival Day

Objective: Students will prepare a butterfly larvae culture vessel.

Materials:

For each pair of students:

Plastic teaspoon

Popsicle stick

Filter paper

Medicine cup (Plastic culture vessels with lid)

Scissors*

For the class:

Culture medium (food)

Live butterfly culture

*provided by teacher

Preparation:

Within the next week, students should build one or two butterfly cages as described on Pages 17 and 18 of this guide or prepare the butterfly sanctuary provided in the kit.

Assessment:

Students will successfully prepare a butterfly larvae culture vessel and display respect for living things when preparing their culture vessel.

Vocabulary:

butterfly

larva/larvae

Learning Activities:

Session 1:

Student pairs should prepare their butterfly larvae culture vessel.

The butterfly larvae will arrive with a container of culture medium (food).

Use the plastic teaspoons to scoop some of the culture medium from the container into the plastic medicine cup to a height of about 5 mm.

Use a popsicle stick to very gently transfer **one** larvae into the culture vessel (medicine cup).

Place the filter paper on the top of the medicine cup, and press the plastic lid down over the filter paper until the lid snaps in place. Cut excess filter paper from around the outside of the lid.

Caution students to never shake or tap the culture vessel.

The culture vessels may be opened for observation purposes. Impress upon the students that butterflies are very fragile in all stages of their life cycle.

Learning Experience 3: Larva

Objective: Students will study the butterfly larvae and make accurate observations. Students will gather accurate data on the larvae they observe.

Materials:

For each pair of students:

2 Butterflies And Moths Student Activity Books

Culture vessel with lid

Double-lens magnifier

Masking tape*

Notebook*

*provided by teacher

Preparation:

Read the background information on Page 4. Have students prepare and organize notebooks for daily entries of observations.

Assessment:

Students will keep an illustrated notebook of their observations of the life cycle of the butterfly.

Vocabulary:

caterpillar

larva

camouflage

Learning Activities:

Session 1:

Students may keep the butterfly larvae culture vessels on their desks so they can observe them daily. Tape may be used to fasten the culture vessels to the desks.

Students should keep a notebook containing drawings of the butterfly larvae and the changes that occur throughout the rest of the butterfly's life cycle. A template for a student notebook is included in the back pocket of the manual. Encourage the use of magnifiers to make observations.

Drawing:

Date:
 Length of larva:
 Comments/Observations:

The activity sheet for Learning Experience #3 in the Butterflies And Moths Student Activity Book shows a diagram of the parts of the larva. Students should label the parts and become familiar with these parts so they can use the vocabulary to identify the parts of the caterpillar in for discussion. (Answers: see Page 5)



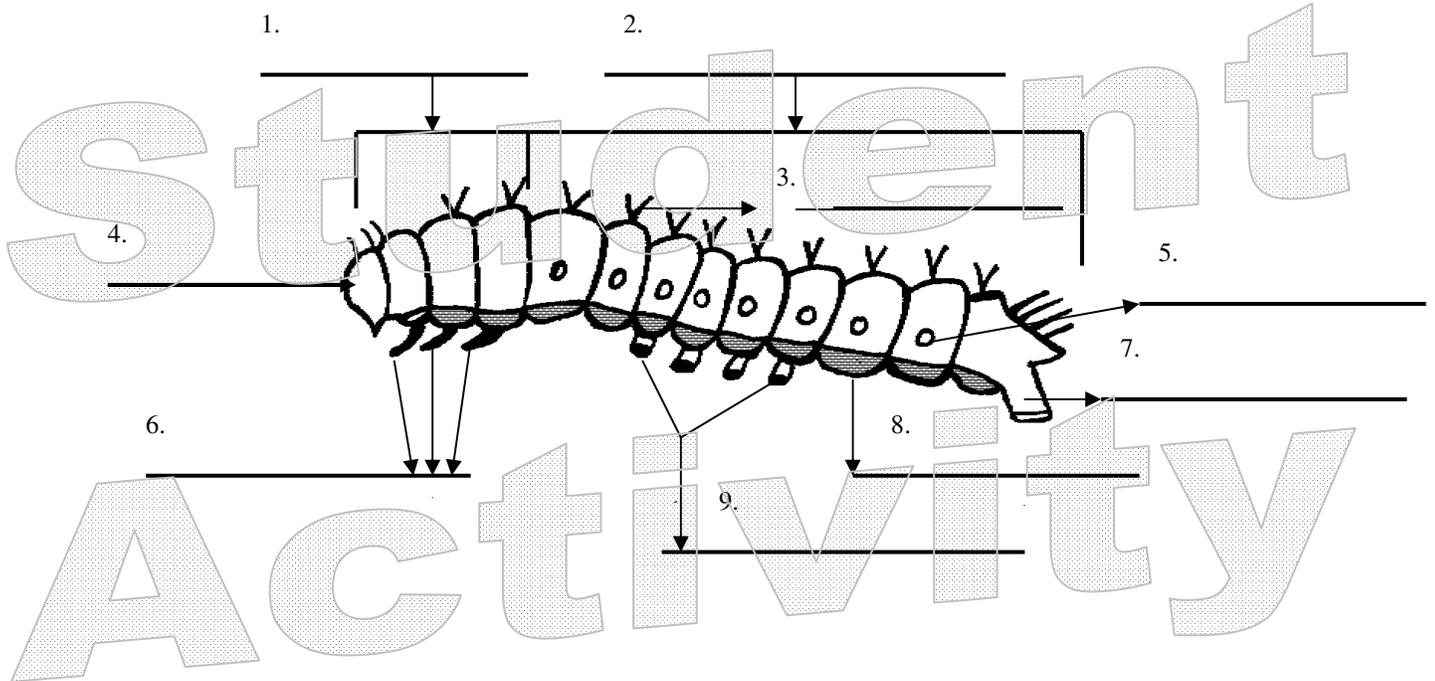
Painted Lady Larva

Discussion Questions:

- o How many legs does a larva have?
- o Are all the legs the same?
- o Do you think a bird would eat a larva? Why or why not?
- o How does a larva protect itself?
- o How can you tell if the larva has grown?
- o Have you ever found a butterfly larva? Where did you find it?
- o Why are there webs in the culture vessels? (The larva spins the webs and uses them to attach to plants.)

CATERPILLAR PARTS

Label the parts of the caterpillar on the lines below. Use the word bank to help you.



WORD BANK

Spiracle	True Legs
Abdomen	Prolegs
Head	Thorax
Segment	Anal prolegs
Bristles (setae)	

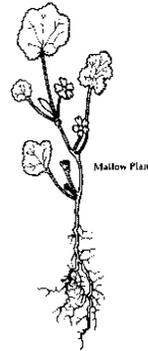
Learning Experience 4: Leaves the Larvae Eat

Objective: Students will predict what they think the larvae will eat and determine the natural food (leaves) the larvae prefer.

Materials:

For the class:

- Culture vessel with lid
- Aluminum foil
- Different types of leaves, including mallow, thistle, hollyhock*
- Chart paper*
- Empty glass aquarium*
- Plastic wrap*
- Small glass jar*
- *provided by teachers



Preparation:

Thistle, hollyhock or mallow plants will be eaten by the larva. Mallow is a creeping weed with geranium-shaped leaves and small pink or white flowers. It is commonly found in school lawns and close to building foundations particularly along the south side of the building. Hollyhock is a perennial with bright flowers and large leaves. This plant is easy to grow from seed but would need to be started two to three months before receiving the larva. Thistle is a prickly plant with tubular flower heads.

Assessment:

Students will identify the natural food for the Painted Lady Butterfly larvae. Student will identify the larvae stage as the stage that eats and grows the most.

Vocabulary:

mallow plant
natural

thistle plant
hollyhock

Learning Activities:

Session 1:

Discussion Questions:

- o What does the larva eat in its container?
- o Make some predictions – What would the larvae eat if they lived outside?

- o How could we find out?

Take the class on a short walk around the school. Have them each find one leaf of a plant they think the larvae will eat. They should identify the type of leaf they have picked. Students should place a 3 cm or smaller portion of the leaf in the culture vessel to see if the larva will eat it. Make sure some students test the mallow leaves, hollyhock leaves and/or thistle leaves. Observe and discuss the results.

Keep a record of what the larvae eat.

Type of leaf	Eaten??

Discussion Question:

- o How much mallow will the larvae eat in a day?
- o Can you use your magnifiers to determine how the larva eats?

Extension:

To impress upon the student the amount of food the larvae eat, dig up a mallow plant. Wash all soil from the roots of the mallow plant. Place in a small jar of water. Form aluminum foil around the stem of the mallow plant and over the opening of the jar. Place the mallow plant and jar in an empty aquarium. Place several larvae on the mallow plant. Cover the top of the aquarium with plastic wrap. Within days, students should see all the leaves of the mallow plant devoured by the larvae.

Learning Experience 5: Cages (optional)

Objective: Students will build butterfly cages. (This learning experience is optional because the butterfly sanctuary included in the kit will work as a “cage.”)

Materials:

For the class:

Nylon mesh

Aluminum foil

Butterfly sanctuary

Pie tin

6 cardboard boxes about 29 X 44 cm.*

(This is the size box duplicating paper and copier paper come in)

Paper clips*

Paper fasteners*

Masking tape*

Box knife*

Different types of leaves, including mallow, thistle, hollyhock*

Scissors*

*provided by teachers

Assessment:

Students will follow directions to build a proper cage in which to care for the butterflies.

Vocabulary:

sanctuary

Learning Activities:

Session 1:

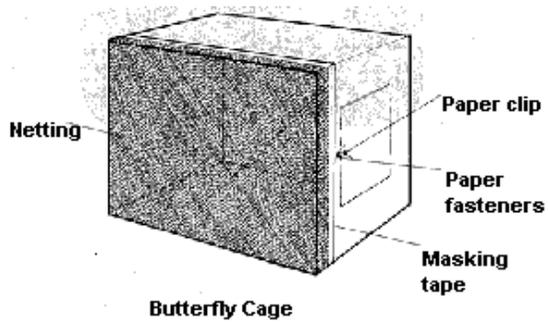
First make a door on one side of the cage. Draw a 15 X 15 cm. square on the center of one side of the box. Cut through three sides of the square. The fourth side will act as a hinge. Use paper fasteners and a paper clip to make a door latch. If the box still has flaps on the top where it was opened, cut them off.

Cut a piece of aluminum foil to fit the bottom of the cage or sanctuary, and place it on the “floor” of the cage or sanctuary. Tape in place. Cut a piece of nylon mesh approximately 10 cm. longer and wider than the open face of the box. Tip the box so the open face is up. Lay the nylon mesh over the opening. Use masking tape to secure the tape to all four sides. Tip

the box up as shown in the illustration below. If more light is desired in the cage, an additional window may be cut in the back and covered with nylon mesh or plastic wrap.

Replace the foil when it becomes soiled or wet. A mallow plant, thistle plant, hollyhock plant, or romaine lettuce will need to be placed in the cage or sanctuary. When the female butterflies lay their eggs, they will lay them on the plant.

If the butterfly sanctuary is used, then the pie tin can be placed at the bottom of the sanctuary to keep its form.



Butterfly
Sanctuary

Learning Experience 6: Pupa

Objective: Students will observe the chrysalis and identify it as the pupa stage of the butterfly.

Materials:

For each pair of students:

Culture vessel with lid

Double-lens magnifier

For the class:

Butterfly cage or sanctuary

Construction paper*

Masking tape*

*provided by teacher

Preparation:

Read background information on the pupa on Page 5. In about one to three weeks, each larva will begin changing into the pupa stage. The larva will spin a little knob of thread on the filter paper and then attach its tail to the knob, shed its skin and become a chrysalis.

Assessment:

Students will identify a chrysalis as the pupa stage of the butterfly life cycle and describe its distinguishing features.

Vocabulary:

chrysalis

pupa/pupae

Learning Activities:

Session 1:

Student pairs should observe and record when the larvae attach themselves to the filter paper.

As a class, observe the chrysalis with magnifiers and discuss this change. Introduce the concepts pupa and chrysalis. Remind students not to touch the pupa. Remove the filter paper from the culture vessel. If construction paper is folded in an accordion fashion and is placed at the bottom of the sanctuary or cage, the filter paper with the chrysalis can be set on its side between the folds. If using the cages, the filter paper can be taped to the top of the

cage so the chrysalises hang from the side a top of the box. Be careful transferring the chrysalises, as even the slightest injury can kill them. An adult butterfly will emerge from each chrysalis in seven to 10 days.

Discussion Questions:

- How fast were the larvae growing?
- What happened to the larvae as time went by?
- Could you tell they were going into the pupa stage? If so, how?
- What happened as they formed into pupae?
- Why do the pupae have to be transferred to the butterfly cages?
- Can you identify the parts of the butterfly that are forming?



Painted Lady Pupa

Learning Experience 7: The Adult

Objective: Students will observe the butterfly emerging from the chrysalis and will label the parts of a butterfly.

Materials:

For each pair of students:

2 Butterflies And Moths Student Activity Books

Double-lens magnifier

For the class:

Butterfly cage or sanctuary with chrysalides

Preparation:

Read background information on adult butterfly on Pages 5 and 6. Adult butterflies will emerge from the chrysalides in seven to 10 days. Usually the chrysalis will begin to “twitch” several hours before the butterfly emerges. The butterflies can be easily injured at this time and should not be touched. The butterflies will pump fluid into their wings to help them unfold. The wings will dry and harden in 24 hours. The adult butterfly will not eat for at least 24 hours after emerging from the chrysalis.

Assessment:

Students will observe a butterfly emerge from a chrysalis and be able to accurately label its parts

Vocabulary:

adult

thorax

emerge

abdomen

metamorphosis

Learning Activities:

Session 1:

If possible, have the students observe a butterfly emerge from the chrysalis. Hopefully, all the butterflies will not emerge on a weekend. Students should continue to illustrate and record their observations in their notebook.

Label the parts of the butterfly on the activity sheet for Learning Experience #7 in the Butterflies And Moths Student Activity Book.

Student pairs can then use their magnifiers to see the parts they labeled on the activity sheet. Students can add additional parts to the picture on the activity sheet from their close observations.

Discussion Questions:

- o What happened to the pupae?
- o How could you tell something was going to happen?
- o Describe what you observed when the butterfly emerged from the chrysalis.
- o What parts of the butterfly do you observe that are the same as the larva? Different?



Painted Lady Adult



Painted Lady Butterfly

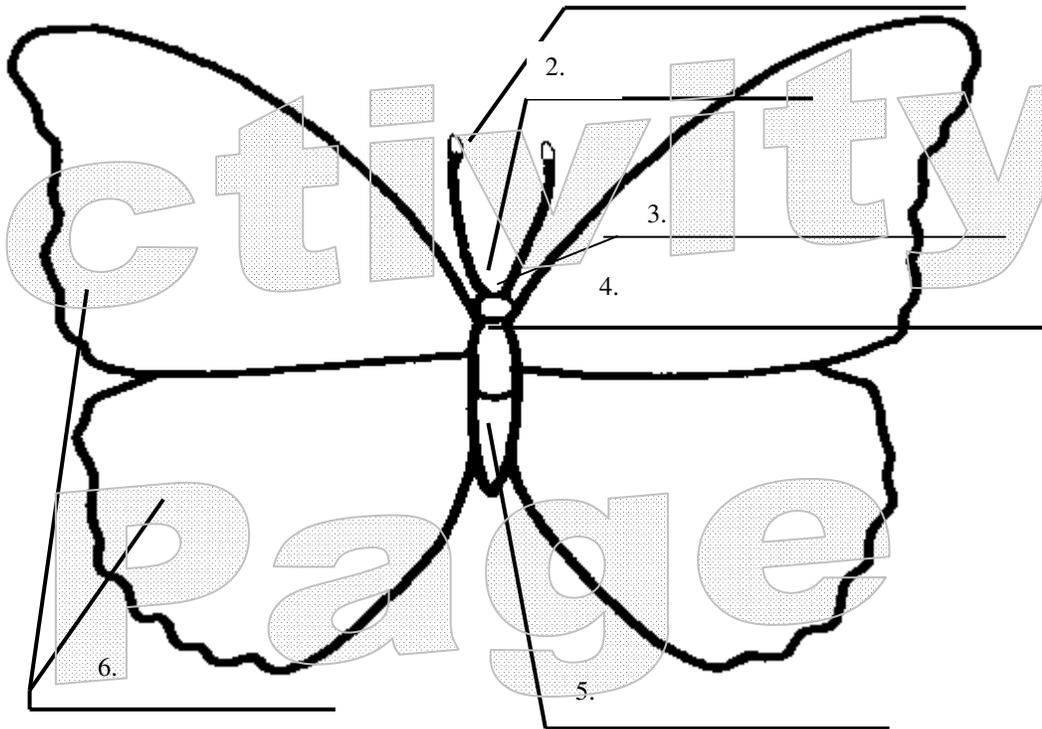
Label the butterfly on the lines below. Use the word bank to help you.

WORD BANK

- Head
- Thorax
- Wings
- Antennae
- Abdomen
- Proboscis

As you observe the butterflies in the sanctuary, add to the drawing below.

1. _____



Learning Experience 8: Stimulus – Response

Objective: Students will describe how butterflies respond to a stimulus.

Materials:

For the class:

Sponge feeder stations (15 cylinder-shaped sponges placed in 15 medicine cups)

Honey in dropper bottle

Water*

Chart paper*

Felt-tip markers*

*provided by teacher

Preparation:

To prepare food for the adult butterflies, dilute the honey by filling the dropper bottle with water. Shake until honey is thoroughly mixed with water. Put two or three feeder stations in each cage. Place several drops of the honey from the packets on each feeder station each day. The butterflies will soon come to the feeder station and unroll their proboscis to feed. Keep the honey refrigerated between feedings, or it will ferment.

Assessment:

Students will observe that a butterfly responds to a stimulus and describe its response.

Vocabulary:

antenna

stimulus

feeding

response

proboscis

Learning Activities:

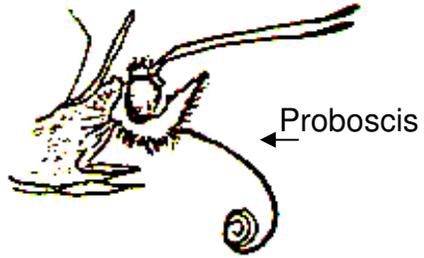
Session 1:

Have students observe to see how the butterflies locate the food. Explain that the smell of honey acts as a stimulus to help the butterfly locate food. The butterfly responds by using antennae and legs to sense the honey. It is unknown if the butterfly can see the honey.

Make a list on chart paper on how animals respond to a stimulus. How do humans respond to the same stimulus?

Discussion Questions:

- o Do butterflies use their antennae, eyes or legs to locate honey?
- o What is a stimulus?
- o What is a response?
- o Do butterflies respond to a stimulus? How?
- o Do you respond to a stimulus? How?



Learning Experience 9: Eggs

Objective: Students will identify the next stage of the butterfly life cycle and record any observations.

Materials:

For each pair of students
Double-lens magnifier

For the class:

Butterfly cage or sanctuary with chrysalides
Mallow, thistle or hollyhock plants*
Empty glass aquarium*
*provided by teacher

Preparation:

Read background information on butterfly eggs on Page 4. After all the adult butterflies have emerged, they will mate and lay eggs. The butterflies should lay eggs on the mallow plant, thistle plant, hollyhock plant or romaine lettuce that has been placed in the cage/sanctuary. The eggs are less than 1 mm in diameter but are visible because of the pale blue color. If you wish to continue to raise butterflies, place the mallow plant on which the eggs have been laid in an empty glass aquarium (20 gallon or larger or a large cage and cover with plastic screen. Replace the plant as soon as the original one dies or is devoured by the larva. Make sure the larva are removed from the plant before it is replaced.

Vocabulary:

generation
offspring
stage

Learning Activities:

Session 1:

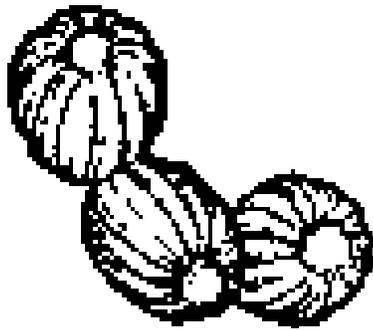
Female uses her senses to be sure the leaf she is laying her eggs on is the right one, one the larva will eat. (sees color of leaf, tastes it with feet, smells leaf with antennae, feels leaf with first pair of legs.)

If one of the plants has not been placed into the cage sanctuary, the butterfly will lay eggs on the netting, however, the caterpillars will not survive unless they are collected from the netting after they hatch and placed on a plant in a small container with culture medium.

Student pairs should observe the eggs of the Painted Lady Butterfly with magnifiers.

Discussion Questions:

- What is the next stage in the butterflies' development?
- Where do the adult butterflies lay eggs?
- How many eggs does an adult butterfly lay?
- How long does it take the eggs to hatch?
- What stage appears after the eggs?
- What happens to the adult butterflies after they lay their eggs?



Painted Lady Eggs

Learning Experience 10: Biotic Potential

Objective: Students will observe the butterfly offspring and explain their biotic potential.

Materials:

For the class:

Biotic potential chart

Preparation:

Students should conclude that only female butterflies lay eggs and that one butterfly lays many eggs. If conditions are right, all the eggs will hatch. The male and female butterflies must mate so the eggs will be fertilized. Only fertilized eggs will hatch.

All living things have an inherent capacity to reproduce and survive. This capacity is reflected in the term “biotic potential.” Populations of animals remain stable because environmental conditions such as heat, light, water, air, food, temperature, disease and predators act as controls.

Assessment:

Students will be able to explain biotic potential and state three reasons why living things do not achieve 100% of their biotic potential.

Vocabulary:

biotic potential

offspring

Learning Activities:

Session 1:

Have the students count as many eggs as they can from what the butterflies have laid and get the appropriate number.

Discussion Questions:

- What are the offspring of the butterfly?
- Do both male and female butterflies lay eggs?
- How many eggs did the butterflies lay?
- What might keep all the eggs from hatching in the classroom? In the wild?

Explain biotic potential. Use the Biotic Potential Chart to illustrate biotic potential.

Discuss survival of living things in nature. Emphasize controlling factors that limit the biotic potential of a species. Include such factors as: predators, disease, availability of food and water, shelter and temperature.

Learning Experience 11: Life Cycle of the Butterfly

Objective: Students will identify and name the stages of the life cycle of a butterfly.

Materials:

For each student:

Butterflies And Moths Student Activity Book

Preparation:

Duplicate the activity sheet.

When a butterfly begins to fade and wither, death can be expected shortly. Some students that are unfamiliar with life cycles in nature become upset at the death of the butterflies.

This could present a good opportunity for a meaningful class discussion on the subject of death. If desired, this situation can be avoided by releasing the butterflies outside during warm weather.

Assessment:

Students will identify the four stages of the life cycle of a butterfly.

Vocabulary:

development

stage

metamorphosis

life cycle

Learning Activities:

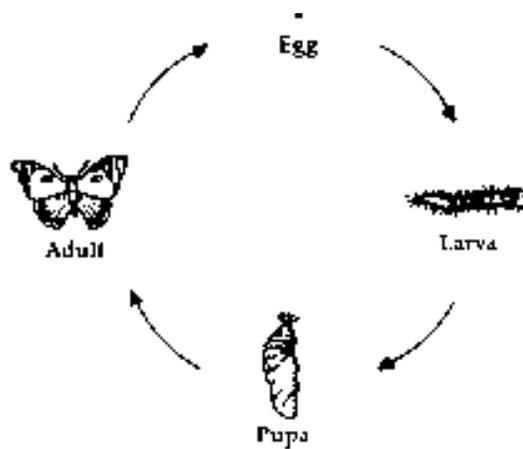
Session 1:

Video – Butterflies (15 min.) can be shown before students complete activity sheet or after they have finished it as a check of their work.

From their observations recorded in their notebooks, students should be able to identify the stages in the life cycle of a butterfly by completing the activity sheet for Learning Experience #11 in the Butterflies And Moths Student Activity Book. The process of growth through these four stages is known as a complete metamorphosis.

Discussion Questions:

- When is the life cycle of a butterfly completed? (Is it ever really completed?)
- What are the stages in a butterfly's life cycle?
- Why is it important to understand a butterfly's life cycle?
- Why might a living thing undergo such vast changes during its life cycle?
- Why are living butterflies important to us?
- How would you feel if there were no butterflies in the world?
- Why are butterflies important to other living things? In what ways do butterflies depend on other living things?
- In what ways do other living things depend on butterflies?

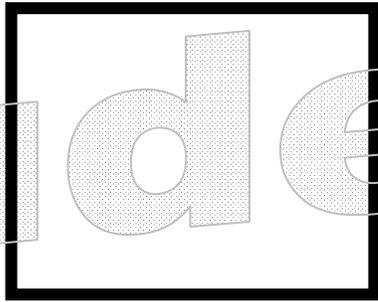


Butterfly Life Cycle

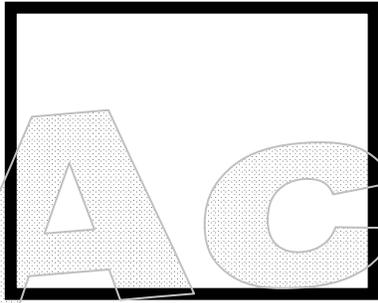
Directions:

Cut out the four stages of the life cycle of the butterfly at the bottom of the page. Paste them in the boxes below next to the correct label.

Student

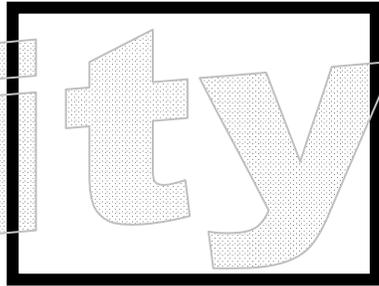


egg



adult

larva



pupa

Page



Learning Experience 12: Butterfly or Moth?

Objective: Students will compare and contrast the differences between a butterfly and a moth.

Materials:

For each student:

Butterflies And Moths Student Activity Book

Video–” Eyewitness – Butterflies & Moths” (35 min.)

Preparation:

The first activity sheet for Learning Experience #12 in the Butterflies And Moths Student Activity Book compares the differences between butterfly and moths. See answer key for the first activity sheet for Learning Experience #12 on Page 35 in this manual. The second activity sheet uses a Venn diagram for comparison of butterflies and moths and is a useful organizer of this information. See answer key on Page 36 in this manual.

Assessment:

Students will identify three ways to distinguish butterflies from moths.

Vocabulary:

cocoon

moth

Learning Activities:

Session 1:

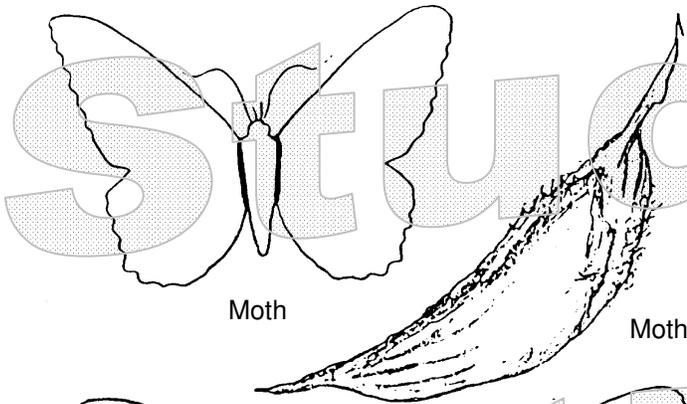
The video “Butterflies & Moths” will introduce the differences between butterflies and moths and help students complete the first activity sheet. The Venn Diagram could also be completed as students are watching the video.

The antennae of butterflies have a “knob” at the end. The antennae of moths are plain or look like small feathers. The body of a butterfly is slender. The body of a moth is thick and bulky. The larva of a butterfly forms a chrysalis and often hangs upside down. The larva of a moth spins a cocoon. The wings of a butterfly are closed in an upright position when the butterfly is resting. Moths usually close their wings around their bodies or hold them open horizontally when at rest.

Extension:

Collect and observe other butterflies and moths to help in comparing and contrasting similarities and differences between butterflies and moths. (See Collecting on Page 2)

ANSWER SHEET



Moth

Moth



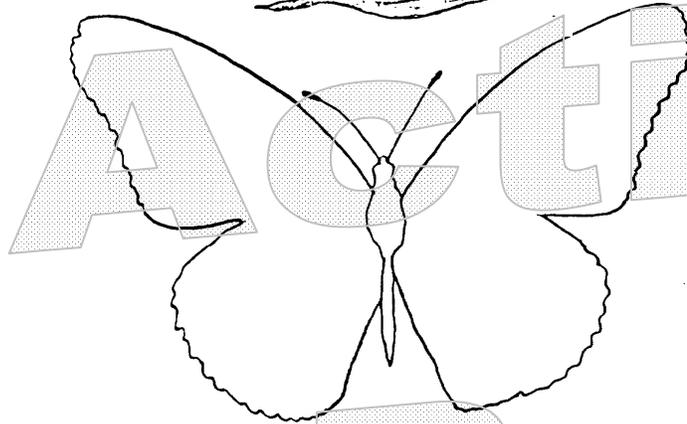
Butterfly



Butterfly



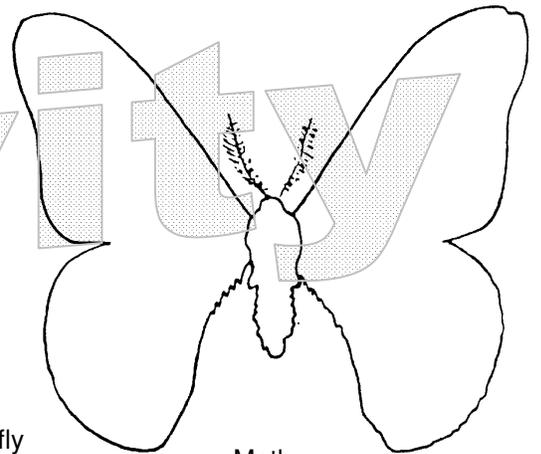
Butterfly



Butterfly



Butterfly



Moth

Activity Sheet for Learning Experience #12

ANSWER KEY

(Students may add other information to the diagram that they learn throughout their study of butterflies and moths.)

Butterfly

Moth

Slender bodies
Long body
Active during the day
(diurnal)
Holds wings up at
rest
Clubbed antennae or
antennae with a knob
at the end of it.
Forms a chrysalis
that hangs upside
down.

Answers
may
vary.

Thick body
Active at night
(nocturnal)
Holds wings across
body at rest.
Feathered antennae
Spins a cocoon.

Name: _____

Date: _____

Butterflies And Moths Student Assessment

Directions: Read the question carefully, and answer based on your knowledge about butterflies and moths. Use a word from the word bank to fill in the blank. Use words only once.

Butterflies	Egg	Chrysalis	Antenna	Larva
Adult	Proboscis	Caterpillar	Life Cycle	

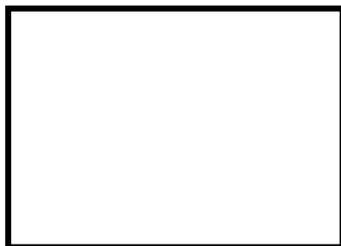
- 1.) The four stages of growth of a butterfly or moth are called the _____.
- 2.) The straw-like tube used for getting nectar is called _____.
- 3.) _____ is the stage in a butterfly's life when it is inside a silk cocoon.
- 4.) The _____ is the first stage of the butterfly's life cycle.
- 5.) A _____ is a worm-like larva of a butterfly or moth.
- 6.) The _____ is the moveable sense organ on the head of insects.
- 7.) The second stage in the life cycle, which comes before the pupa, is called _____.
- 8.) A fully developed insect is called a(n) _____.
- 9.) A Painted Lady is one of the kinds of _____ we have been studying.
10. Draw and label the life cycle of a butterfly.



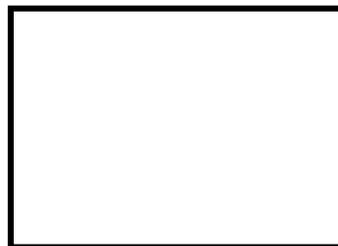
1. _____



2. _____

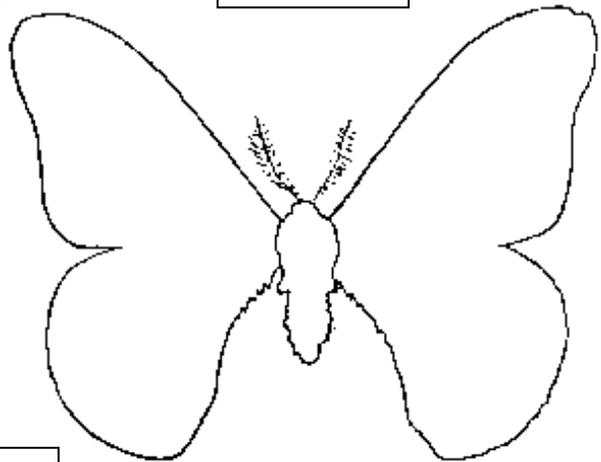
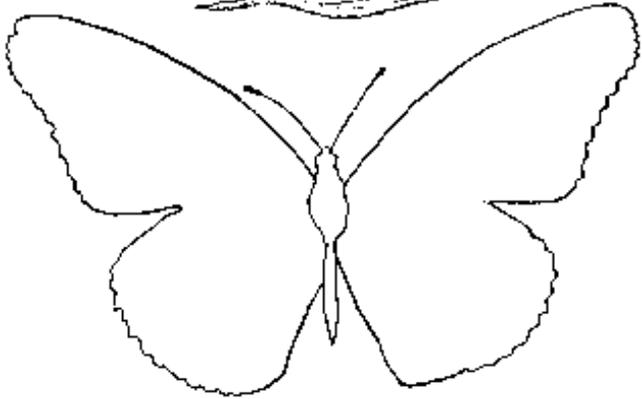
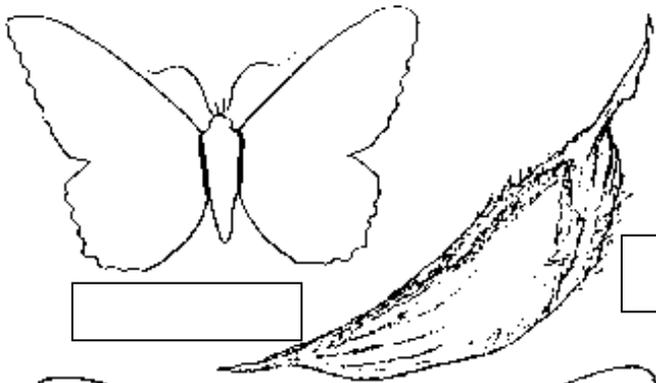


3. _____



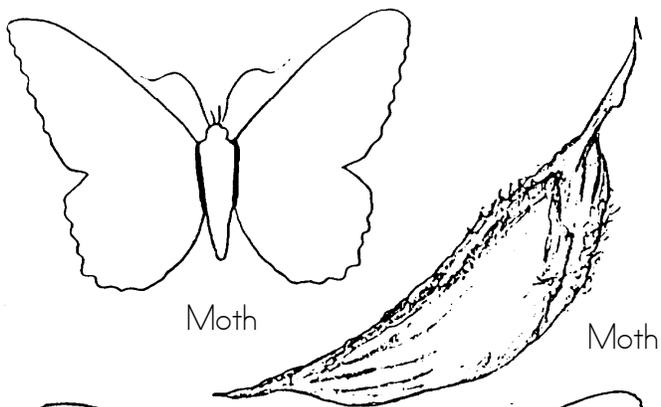
4. _____

(11.-19.) Label each drawing below as being either a moth or a butterfly.



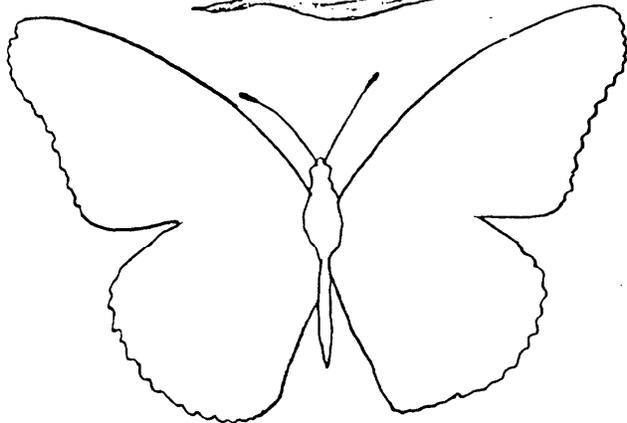
Butterflies And Moths Student Assessment Key

1. Life cycle
2. Proboscis
3. Chrysalis
4. Egg
5. Larva
6. Antenna
7. Caterpillar
8. Adult
9. Butterflies
10. Answers will vary
- 11.-19.



Moth

Moth



Butterfly



Butterfly



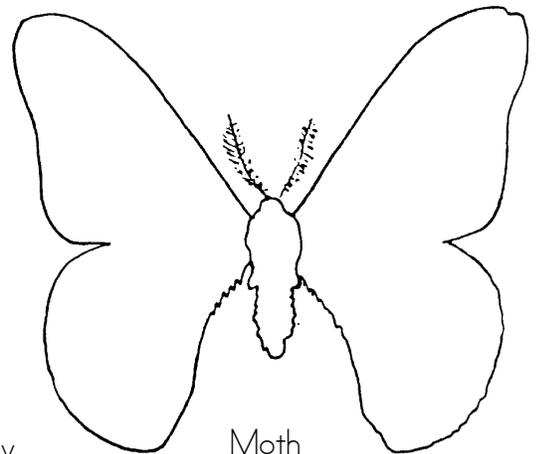
Butterfly



Butterfly



Butterfly



Moth

MORE IDEAS

Language Arts

- ◆ Keep a daily journal of growth, activity and changes observed in caterpillars/butterflies.
- ◆ Publish a class book of caterpillar information.
- ◆ Write an acrostic poem about a butterfly. Haiku and cinquain poetry can also be used.
- ◆ Create stories (fiction or nonfiction) about the life adventure of a caterpillar or butterfly.
- ◆ Create a first person point of view story about the larva in the chrysalis changing into a butterfly.
- ◆ Write an article using a butterfly as the narrator describing metamorphosis.
- ◆ Research to find what kinds of caterpillars have been found outdoors and what they will become, their needs and their place in the natural world.
- ◆ Predict what the butterfly will look like, how big it will be. Draw a picture of what students think the butterfly will look like.
- ◆ Make a calendar recording information about the caterpillars and/or butterflies.
- ◆ Ask students to read a book about butterflies to smaller children. Students can also read a story they authored.
- ◆ Share books with your class on the topic of butterflies.

Book Suggestions:

The Very Hungry Caterpillar by Eric Carle
Caterpillar Diary by David Drew
The Life of the Butterfly by David Drew
Sometimes Things Change by Patricia Eastman
The Longest Journey in the World by William Barrett Morris
Amanda's Butterfly by Nick Butterworth
Charlie the Caterpillar by Dom DeLuise
The Life of the Butterfly by Heiderose and Andreas Fischer-Nagel
Discovering Butterflies by Douglas Florian
Remember the Butterflies by Anna Grossnickle Hines
I Wish I Were a Butterfly by James Howe
Where Butterflies Grow by Joanne Ryder
Amazing Butterflies and Moths by John Still
The Lamb and the Butterfly by Arnold Sundgaard
The Butterfly Hunt by Yoshi
A Worm and a Butterfly, Callahan, J.O.
Caterpillar Who Turned Into a Butterfly, Chubby Board Books
Ten Loopy Caterpillars, Rodney Mc Rae
The Caterpillar and the Polliwog, Jack Kent
Our Caterpillars, Herbert H. Wang
Diary of a Monarch Butterfly, Susan L. Thompson
The Butterfly Book, Cynthia Overbeck

Hope for the Flowers, Trina Paulus
From Egg to Butterfly, Marlene Reidel
It's Easy to Have a Caterpillar Visit You, Caroline O'Hagan
Butterfly and Moth Eyewitness Books, Paul Whalley

Art

- ◆ Make tissue paper "stained glass" butterflies.
- ◆ Make mobiles of butterflies and their life cycle with oak tag and string.
- ◆ Make large models of butterflies or moths with papier-mâché. Use oak tag for wings and pipe cleaners for legs and antennae.
- ◆ Make a bulletin board on Butterflies and Moths from pictures brought in from home.
- ◆ Draw cartoons showing the butterfly's stages of development.
- ◆ Design paper butterfly "puppets". Pair students, and have them write a conversation (Language Arts). Perform a puppet show for the class or a class of younger students.

Social Studies

- ◆ Research butterflies from different parts of the country/world.
- ◆ Discuss how some caterpillars are very destructive, such as the eastern tent caterpillar and gypsy moth caterpillar.

Math

- ◆ Measure the caterpillar to determine growth rate in metrics or standard measurement.
- ◆ Graph measurements of growth rate, days of each stage of the life cycle, etc. on different types of graphs.
- ◆ Construct a geometric caterpillar using tessellation patterns. Trace shapes on construction paper, cut out and combine to form caterpillar.

Science

- ◆ Grow plants from seed of hollyhock, thistle, fiddleneck or nettle (begin seeds two or three months before butterfly larvae arrive).
- ◆ Study other animals that fly such as birds, bats and insects.
- ◆ Dissect a flower to find the nectaries. (Which parts work together to product seeds?)
- ◆ Discuss the characteristics of an insect. Go on an insect hunt around the schoolyard. Students can identify and document in their journals any insects they see.

Health

- ◆ Research the use and effect of pesticides on our environment.
- ◆ Find out which insects are harmful to humans and/or the environment. Then find out which ones are helpful.

INQUIRY AND PROCESS SKILLS

Classifying	Arranging or distributing objects, events, or information in classes according to some method or system.
Communication	Giving oral and written explanations or graphic representations of observations.
Creating Models	Displaying information by means of graphic illustrations or other multi-sensory representations.
Formulating Hypotheses	Constructing a proposition or assumption of what it thought likely to be true based on reasoning, which serves as a tentative, testable theory.
Gathering & Organizing	Collecting information about objects and events which show a specific situation.
Generalizing	Drawing general conclusions from information.
Identifying Variables	Recognizing the characteristics of objects or events which are constant or change under different conditions.
Inferring	Making a statement or conclusion based on reasoning or prior experience to explain an observation.
Interpreting Data	Analyzing information that has been collected and organized by describing apparent patterns or relationships in the information.
Making Decisions	Choosing an alternative from among several and basing the judgment on defensible reasons.
Manipulating Materials	Handling or treating materials, equipment or procedures skillfully and effectively.
Measuring	Making quantitative observations by comparing to a standard.
Observing	Becoming aware of an object or even by using any of the senses to identify properties.
Predicting	Making a forecast or estimate of what future events or conditions may occur.

GLOSSARY

Adult:	an animal that is fully developed or mature.
Abdomen:	the lower portion of the insect's body, below the thorax.
Antenna:	movable sense organ on the head of insects.
Biotic potential:	the capacity of an organism or species to reproduce and survive assuming no death due to unfavorable environmental conditions.
Butterfly:	diurnal insect with a slender body and broad, brightly marked wings.
Camouflage:	to conceal or disguise
Care:	protection, to watch over
Caterpillar:	the worm-like larva of a butterfly or moth.
Chrysalis:	pupa of insects, such as butterflies, that pass the pupil stage in a quiescent condition enclosed in a firm case. Plural: chrysalides or chrysalises.
Cocoon:	a silk enclosure which an insect larva forms about itself and in which it passes the pupa stage.
Development:	to cause to grow or expand.
Emerge:	to come out into view.
Feeding:	an act of eating.
Generation:	the average span of time between the birth of parents and that of their offspring.
Handling:	to touch, pick up or carry with the hands.
Hollyhock	A plant of the mallow family with large rounded leaves and tall spikes of colorful flowers.

Humane:	characterized by compassion and sympathy for human being and animals.
Larva:	the worm-like stage of most insects following the egg stage and before the pupa stage. Plural: larvae
Life Cycle:	sequence of stages of growth in the life of an organism.
Mallow plant:	weed with geranium shaped leaves and small pink flowers.
Medium:	a nutrient system for the artificial cultivation of organisms (food).
Metamorphosis:	a change in body structure from egg to adult.
Moth:	a nocturnal insect with a thick body and feathered antennae.
Natural	existing in or produced by nature.
Offspring:	the descendants of an animal or plant.
Proboscis:	the sucking organ of a butterfly, straw like tube.
Pupa:	the stage between the larva and adult stages characterized by a long period of rest. Plural: pupae
Respect:	to show regard or consideration for.
Response:	a reply or a reaction resulting from stimulation.
Sanctuary:	a structure that allows the butterflies to grow and develop.
Stage:	one of the periods of growth and development of a plant or animal.
Stimulus:	something in nature that directly influences an activity of a living organism.
Thistle Plant:	prickly plant with heads of tubular flowers.
Thorax:	the portion of an insect's body between the head and abdomen.

TEACHER REFERENCES

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Palmer, E. Laurence and Fowler, H. Seymour, Fieldbook of Natural History, McGraw-Hill Book Company, New York, 1975.

Subarsky, Zachariah, et.al., Living Things in Field & Classroom, Minnesota Mathematics and Science Teaching Project, University of Minnesota, 1967.

Media Net

Please use the BOCES MediaNet Web site to check out the media (books, models, movies, Distance Learning opportunities, etc.) available on this science topic at <http://medianet.caboces.org>. Call the media library to order media materials and to check on new materials that are available. The number to be reached is (716)376-8212.

Digital Resources

Please visit our Web site at www.mstkits.org to access links to Web sites and other digital resources that correlate with this science topic.

FIELD TRIP/INFORMATION CENTER

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Major Science Concepts To Be Addressed

Living objects, including plants and animals, live and grow when their needs are met.

Each animal, including humans, has properties that enable the animal to meet its needs.

The parts of animals have functions which help the animal to live and thrive.

Wings, legs or fins enable some animals to seek shelter and to escape predators.

The mouth, including teeth, jaws and tongue, enables some animals to eat and drink.

Eyes, nose, ear, tongue and skin of some animals enable the animal to sense their surroundings.

Claws, shells, color of body covering and other structures enable some animals to protect themselves from other animals.

Each kind of animal goes through its own stages of growth and development during the life cycle of the animal.

Animals go through a particular set of stages from infancy to adult. For example: many insects go from egg to larva to pupa to adult.

Animals have life spans of varied length.

Some animals, including humans, move about and meet their needs. For example:

seasonal migration

seeking shade, food or water

seeking escape from danger

Plants and animals are dependent on other plants and animals.

Animals depend on plants.

For example:

A source of food

Each kind of plant or animal continues beyond the life span of the individuals because each kind is able to produce offspring.

Adult female animals are able to produce enough young suited to survive to produce the next generation of that kind of animal.

Each generation of animals goes through changes in form from young to adult. The adult gives rise to the young of the next generation. This completed sequence of changes in form is called a life cycle.

Some types of young animals are able to live and thrive without depending on adults of the previous generation for care.

Animals have the potential to produce numerous offspring during their adult stage.

Under actual conditions, not all of the young produced by the female grow and become adults. The number of animals of a particular kind living in an area is called the population.