Metamorphosis

Metamorphosis means "change of form." It's the way insects grow and mature. Their lives are divided into separate stages for resting, growing and reproducing.

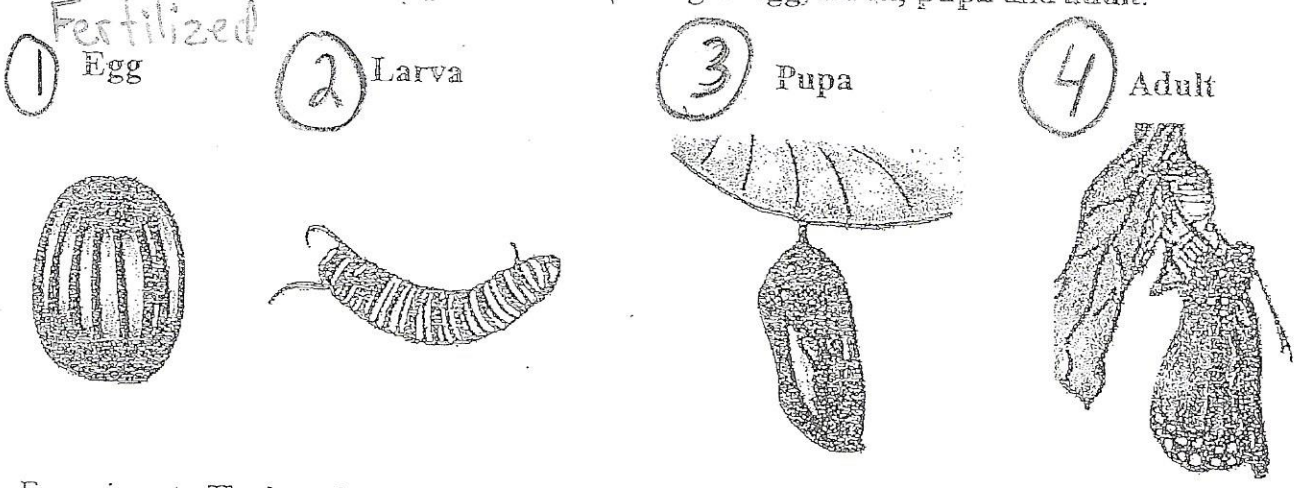
Gradual growth vs. growth in stages

Humans grow gradually. You began life as a baby and grow a little at a time until you're an adult. While you're growing, the basic plan of your body doesn't change. You have the same body your whole life.

Insects grow in stages. The cycle of stages is called **metamorphosis**. For many insects, the stages are so different from one another that you might not recognize them as the same animal.

Complete metamorphosis

Complete metamorphosis is the way butterflies, bees, flies, beetles and many other insects develop. Complete metamorphosis has four stages: **egg**, **larva**, **pupa** and **adult**.



Every insect begins life as an egg. The egg is the embryo stage.

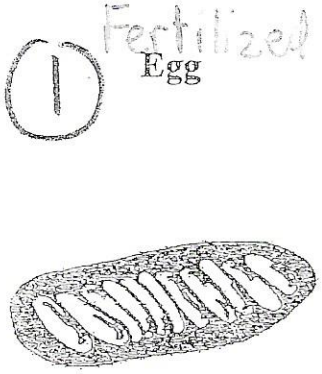
The larva hatches from the egg. The larva is the eating and growing stage. Some insects don't eat at all after this stage. Larvae don't look like adults. Caterpillars, grubs and maggots are larvae that grow up to be butterflies, beetles and flies as adults. A larva's exoskeleton can't stretch or grow, so the larva sheds its skin, or molts, several times as it grows.

When a larva has finished growing, it forms a pupa (plural: **pupae**). The pupa is the insect's transforming stage. Outside, the pupa looks as if it's resting. But inside, the entire body is rearranging. New organs, muscles and body parts develop.

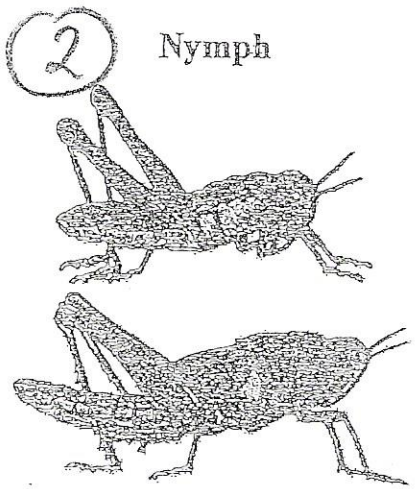
When it has finished changing, the pupa molts one last time, emerging as an adult. The adult is the reproductive stage. The adult has all the identifiable insect features: three body sections, six legs, two antennae and usually wings.

Incomplete metamorphosis

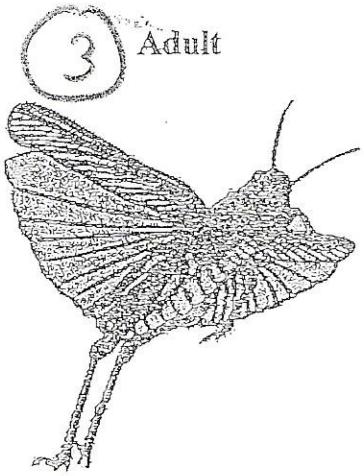
Some insects, such as grasshoppers, dragonflies and cockroaches, develop by incomplete metamorphosis. Incomplete metamorphosis has three stages: **egg**, **nymph** and **adult**.



Early, basic development happens in the egg.



The nymph is the eating and growing stage. Nymphs often look like smaller versions of adults, without wings. The nymph's exoskeleton can't grow or stretch, so the nymph needs to shed its skin, or **molt**, in order to grow. The periods between molts are called **instars**. Each instar looks a little more like the adult form. Wing buds form and grow on the nymph's back.



The adult is the reproductive stage. The nymph emerges from its final molt as an adult. In species that have wings, the wings don't fully appear until this stage. Adults mate, females lay eggs, and the cycle begins again.

Return to the Insects Page | Return to Pacific Science Center Exhibits On-Line

Metamorphosis Quiz

Name: _____
Date: _____
Class: _____

1. What is one major difference between complete and incomplete metamorphosis?

a. Incomplete metamorphosis includes a pupa stage; complete metamorphosis does not
b. Incomplete metamorphosis includes a nymph stage; complete metamorphosis does not
c. Incomplete metamorphosis includes a larval stage; complete metamorphosis does not
d. Incomplete metamorphosis includes an egg stage; complete metamorphosis does not

2. During the pupa stage, insects are often dormant. In this phrase, what is the best synonym for "dormant?"

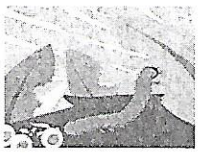
a. Hungry
b. Inactive
c. Water-dwelling
d. Microscopic

3. Place the following stages of complete metamorphosis in order: A) Larva; B) Pupa; C) Egg; D) Adult

a. C, A, B, D
b. C, B, A, D
c. A, C, B, D
d. B, C, A, D

4. Many immature animals lose the ability to _____ after they finish metamorphosis

a. Eat
b. Fly
c. Lay eggs
d. Breathe underwater

5.  **What can you infer from the fact that caterpillars eat so much?**

a. The leaves they eat have very little nutritional value.
b. They have extremely low metabolic rates.
c. The growth and change they undergo requires a lot of stored energy.
d. They stop eating once they become moths or butterflies.

6. How do nymphs differ from larvae?

a. Nymphs look like adults; larvae don't
b. Larvae eat; nymphs don't
c. Larvae have wings; nymphs don't
d. Nymphs spin cocoons or chrysalises; larvae don't

7. Most insect larvae are vermiform in appearance. What is the best synonym for "vermiform?"

a. Frightening
b. Diverse
c. Colorful
d. Wormlike

8. If you wanted to find the eggs of a creature that undergoes incomplete metamorphosis, where would you look?

a. On the leaves of trees
b. Buried underground
c. In carefully-constructed nests
d. In a pond

9. How do damselflies and butterflies differ from frogs?

a. Damselflies and butterflies undergo complete metamorphosis; frogs undergo incomplete metamorphosis
b. Immature damselflies and butterflies live on land; immature frogs live underwater
c. Damselflies and butterflies are insects; frogs are amphibians
d. Damselflies and butterflies shed their skins; frogs don't

10. When do humans undergo metamorphosis?

a. In their mothers' wombs
b. During their first few years of life
c. At puberty
d. Humans don't undergo metamorphosis

Name: _____ Date: _____ Period: _____

Metamorphosis

Complete Metamorphosis Compared to Incomplete Metamorphosis

Directions: Please circle the correct answer

1. Metamorphosis can be described as

A) Change in form

B) Growth in separate stages

C) The way insects grow and mature

D) All of the above

2. Which of following insects goes through complete metamorphosis?

A) Dragonflies

B) Grasshoppers

C) Bees

D) Cockroaches

3. Which of the following insects goes through incomplete metamorphosis?

A) Butterflies

B) Flies

C) Ladybugs

D) Dragonflies

4. Which is of the following is the transformation stage in complete metamorphosis?

A) Egg

B) Larva

C) Pupa

D) Adult

5. Which is the eating and growing stage in complete metamorphosis?

A) Egg

B) Larva

C) Pupa

D) Adult

6. Which is the stage of complete metamorphosis when insects usually develop their three body sections, six legs, two antennae, wings and are now able to reproduce?

A) Egg

B) Larva

C) Pupa

D) Adult

7. Which of the following is the eating and growing stage in incomplete metamorphosis?

A) Egg

B) Nymph

C) Adult

8. What is the name of a fertilized egg "the first diploid body cell" which all organisms begin as?

_____

9. What is the name of the outer covering insects shed during their eating and growing stage?

_____

10. The shedding of this outer covering of insect is known as

_____

Bonus

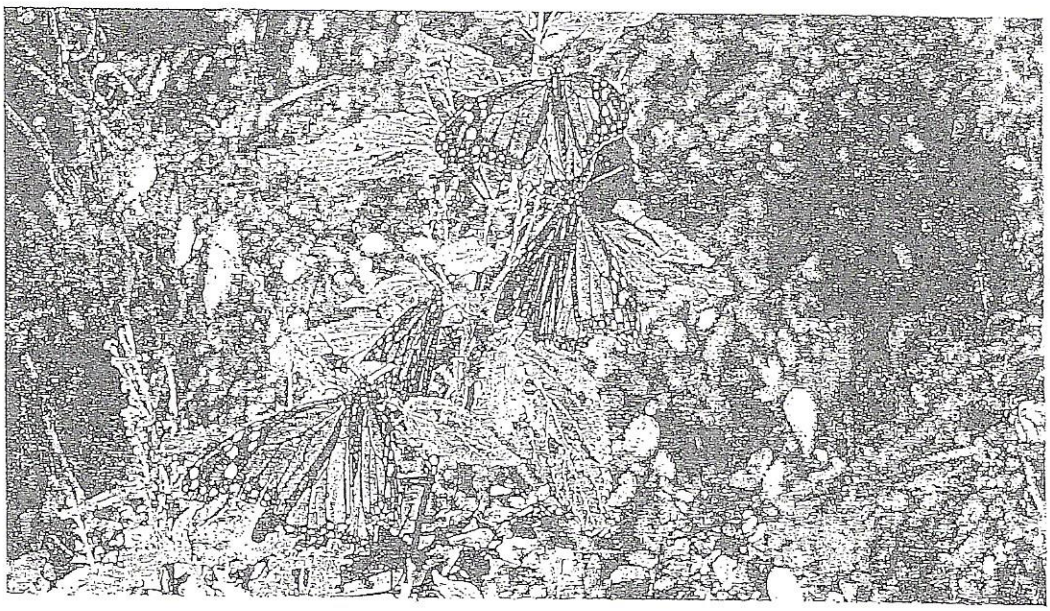
Do most insects perform internal fertilization or external fertilization, support your answer.

_____

_____

Scientists worry over disappearing monarch butterfly

By McClatchy Foreign Staff, adapted by Newsela staff on 04.17.14
Word Count 964



Monarch butterflies take some sun on a branch in the Monarch Butterfly Biosphere Reserve in Mexico's Michoacan state, March 21, 2014. Photo: Tim Johnson/MCT

1

ANGANGUEO, Mexico — On a high mountain slope in central Mexico, a patch of fir trees looks dusted in orange and black. In fact, millions of monarch butterflies cloak the trees. The forest murmurs with the whir of their flapping wings.

2

Every year, hundreds of millions of monarch butterflies find their way on what may be the world's longest insect migration. The monarchs travel the length of North America to pass the winter in central Mexico. Each are so light that 50 together weigh barely an ounce.

3

Yet the great monarch butterfly migration is in danger because of runaway use of weed killers, extreme weather, and deforestation. Monarch butterfly populations are plummeting. The colonies of butterflies in central Mexico are dense, with as many as several million butterflies in one acre. But this year, the colonies were far smaller than ever before.

Scientists say Mexico's monarch butterfly colonies are on the brink of disappearing. If the species were to vanish, a beloved insect with powerhouse stamina that most school kids can easily identify would be gone.

"They Are Pretty Tough"

"We see these things as so delicate. But if they migrate a distance of some 2,000 miles, from Canada all the way down to Mexico, they are pretty tough," said Craig Wilson, a scientist at Texas A&M University.

The orange-and-black monarch butterfly is the state insect of Alabama, Idaho, Illinois, Minnesota, Texas, Vermont and West Virginia. It's also the symbol of a trade agreement which binds Mexico, the United States and Canada.

In February, President Barack Obama met with Mexican President Enrique Pena Nieto and Canadian Prime Minister Stephen Harper. They agreed to work together to ensure the survival of the monarch butterfly.

Scientists say there are many possible reasons for the monarch's decline, but they're focusing now on one major one: Monarch butterflies can't survive without the milkweed.

The milkweed is a lowly broadleaf plant that's widely treated as a weed to be eradicated. It is doused with herbicides in farmlands and along highway shoulders. Milkweed is most common in the high-grass prairies of Canada and the U.S. Midwest, but its 70 varieties also grow along the Atlantic and Pacific coasts, in the Caribbean, and elsewhere.

Massive Loss Of Milkweed

Female monarchs lay eggs on milkweed. When they hatch, the larvae grow into caterpillars that feed on the milkweed's leaves. Those leaves contain a poison that makes the monarchs resistant to their predators. The caterpillars then form chrysalises and emerge as butterflies.

Over the past decade, U.S. fields containing milkweed have declined sharply. Orley "Chip" Taylor, a monarch expert at the University of Kansas, calls the loss "massive."

The use of new genetically modified corn and soybean types that can withstand herbicides has added to the loss. Now farmers use a herbicide that kill weeds with a vengeance. That has had a huge impact on milkweed, which before could grow among crops or at the edges of fields.

"The crops survive but any weeds, including milkweed, don't," said Wilson, the scientist at Texas A&M.

At the same time, the size of the colonies of monarchs spending winters in central Mexico has dropped.

Nearly two decades ago, in the winter of 1996-97, dense monarch colonies covered 44.9 acres of fir forest. Last winter, the colonies covered only 1.7 acres, a plunge of nearly 44 percent from just the year before.

Dwindling Colonies A Warning?

Most monarchs live only a little more than a month. But one generation each year lives seven or eight months, long enough to migrate to central Mexico before winter sets in. There, they often cluster around the same fir trees as their forebears, perhaps drawn by chemical cues. In the spring, the monarchs return to the north, where they lay eggs on milkweed and then die, giving way to a new generation.

The dwindling monarch colonies worry scientists, who fear they may also be a warning of other environmental crises. But in this region of Mexico, the decline also threatens people's livelihood. Butterfly tourism has grown since scientists first came across the dense winter colonies in 1975.

In Mexico's eastern Michoacan state, butterfly lodges cater to butterfly lovers. Fernando Guzman Cruz, a member of a group that protects the local butterfly reserve, says only 55,000 visitors came this season. That's a 50 percent drop from a year earlier, he said. Cruz blames the decline on U.S. agricultural practices.

"We want you to stop killing the milkweed," he told a U.S. visitor.

Scientists also worry what the decline of the monarch butterflies means for other species.

"If monarchs are in trouble, you can practically be assured that there are a number of species that are also in trouble," said Sonia Altizer, an ecologist. Other insects and birds rely on the same environment as the butterflies, she said.

How To Help Monarch Butterflies In Your Area

One of the main reasons for the recent decline of monarch butterflies, scientists think, is the eradication of milkweed plants — which the monarchs lay eggs on and their larvae eat. Here are suggestions how individuals can help:

— Plant native milkweed in your yard and encourage local government to plant it in parks. There are several sources for free milkweed seeds. Consult livemonarch.com for sources of seeds. Monarchwatch.org provides a list of providers of milkweed plants and seeds. Be sure to determine which variety is appropriate to the area where you live.

23

— Join programs to monitor monarch butterfly movements and presence in your area. A national count conducted by the North American Butterfly Association is July 1 in Canada and July 4 in the United States. The association's website is naba.org.

24

— Write to legislators to encourage them to include milkweed among the plants that are seeded along highway roadsides. The roadsides along monarch migratory routes are especially important.

Name _____ Date _____ Period _____

Monarch Butterfly Migration

Directions: Please answer the following questions in complete sentences.

Use the question to help lead you into your answer while using proper grammar and correct punctuation.

#1 In what city and country does this article take place?

_____

_____

#2 What type of trees do the orange and black Monarch butterflies live on while they visit central Mexico?

_____

_____

#3 Why has the Monarch migration to central Mexico become so dangerous causing their population to plummet?

_____

_____

#4 When the Monarchs migrate back to their homes in the spring which type of plant do they lay their eggs on?

_____

_____

#5 This year there was only 55,000 people who visited Mexico to see the Monarch migration, a 50% drop from the previous year. How many visitors did central Mexico get the previous year?

_____

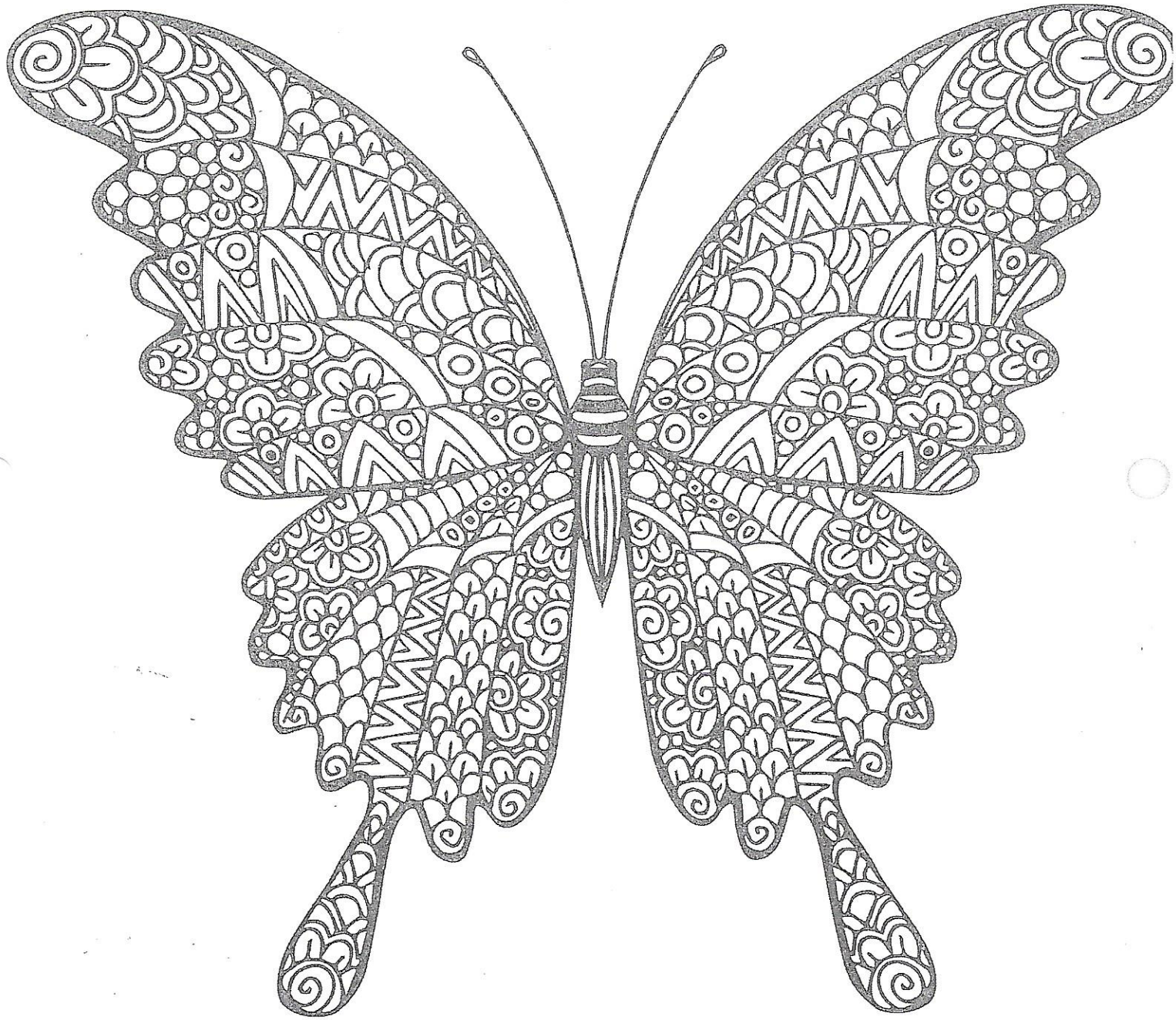
#6 How can we help the Monarchs?

_____

_____

_____

_____



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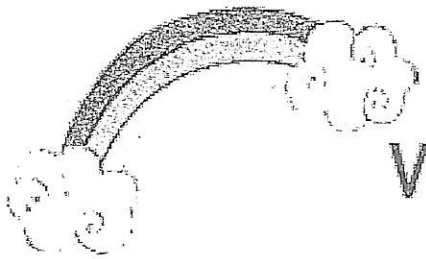
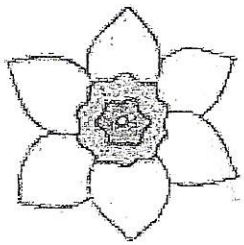


Spring Word Search



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blossom daffodil green growth

melting puddle rainbow raindrops

seeds sunshine tulips umbrella

Name: _____ Date: _____ Period_____

Metamorphosis of Insects Powerpoint Project

Complete Metamorphosis Compared to Incomplete Metamorphosis

Slide #1 (10 points)

Title Page – include name, date, period, title from these directions and the definition of metamorphosis. Also include a picture of two insects that perform metamorphosis (one complete, one incomplete) that will be studied in this powerpoint slideshow.

Slide #2 (10 points)

Complete Metamorphosis Overview – list all four stages of complete metamorphosis in order and a picture of the insect you will be studying.

Slide #3 (10 points)

Complete Metamorphosis Stage #1 "Fertilized Egg" – Include a picture and description of the first stage of complete metamorphosis for the insect you chose.

Slide #4 (10 points)

Complete Metamorphosis Stage #2 "Larva Stage" – Include a picture and description of the second stage of complete metamorphosis for the insect you chose.

Slide #5 (10 points)

Complete Metamorphosis Stage #3 "Pupa Stage, Transformation Stage" - Include a picture and description of the third stage of complete metamorphosis for the insect you chose.

Slide #6 (10 points)

Complete Metamorphosis Stage #4 "Adult Stage"- Include a picture and description of the fourth stage of complete metamorphosis for the insect you chose.

Slide #7 (10 points)

Incomplete Metamorphosis Overview – list all three stages of incomplete metamorphosis in order and a picture of the insect you will be studying.

Slide #8 (10 points)

Incomplete Metamorphosis Stage #1 "Fertilized Egg" - Include a picture and description of the first stage of incomplete metamorphosis for the insect you chose.

Slide #9 (10 points)

Incomplete Metamorphosis Stage #2 "Nymph Stage"- Include a picture and description of the second stage of incomplete metamorphosis for the insect you chose.

Slide #10 (10 points)

Incomplete Metamorphosis Stage #3 "Adult Stage" - Include a picture and description of the third stage of incomplete metamorphosis for the insect you chose.

Slide #11 (10 points)

References – List any websites or additional resources you used information from.