



Life Science

Plant and Animal Adaptation

Advanced Level

Life Cycles of Animals

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INSIDE
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Life Cycles of Animals

How are animals well-suited to live in their environments?

CORE CURRICULUM STATEMENTS

Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Some traits of living things have been inherited (e.g., color of flowers and number of limbs of animals).

Some characteristics result from an individual's interactions with the environment and cannot be inherited by the next generation (e.g., having scars; riding a bicycle).

Organisms maintain a dynamic equilibrium that sustains life.

All living things grow, take in nutrients, breathe, reproduce, and eliminate waste. LE 5.1b An organism's external physical features can enable it to carry out life functions in its particular environment.

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AL

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by Linda Barr





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Table of Contents

Introduction:

Is It Alive? 5

Chapter 1:

What Do Living Things Need? . .6

Chapter 2:

The Cycle of Life10

Metamorphosis12

Three-stage or Incomplete

Metamorphosis15

Four-stage or Complete

Metamorphosis17

Chapter 3:

Traits of Animals20

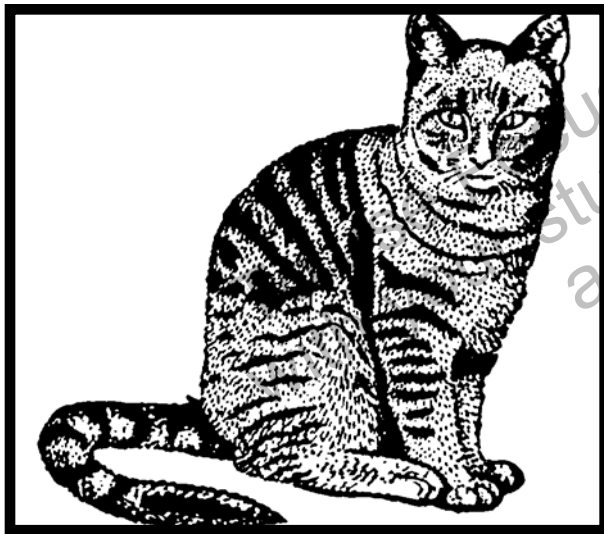
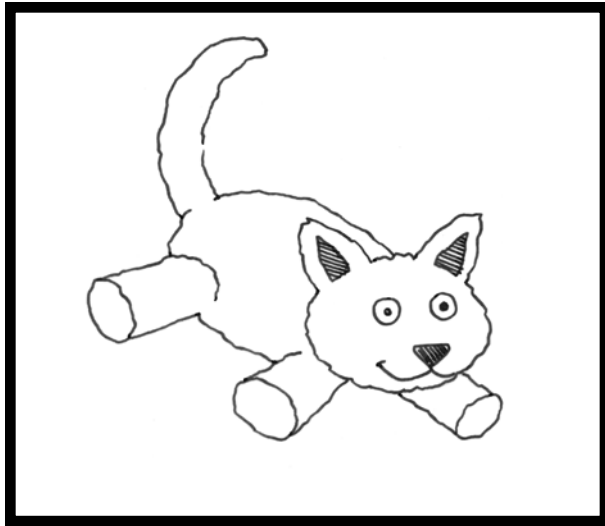
Glossary22

To Find Out More23

Index24

–Predict–

*What do you think you will
learn from reading this book?*



Only one of these drawings is of a living cat. It needs food for energy and air to breathe. If it sees a mouse, this cat will chase it. It can reproduce and have kittens. The other cat is a stuffed animal so it is not alive. It will never grow, change, or move on its own.

INTRODUCTION

Is It Alive?

You find a round, hard thing in the soil and wonder if it is alive. You poke it with a stick, and when it moves, you know it's alive. Animals react to changes around them, including a poke from a stick. Plants react to changes around them, too. For example, many flowers bloom when the sun shines on them. Seeds sprout when they have enough warmth and moisture around them.

A living plant or animal is called an **organism**. Organisms react to changes, but what else is true of them?

- They reproduce, creating new plants or animals.
- They need energy such as food or sunlight to stay alive.
- They take in **gases** from the air.
- They are made of **cells**.
- They grow and change.

organism: a living thing

gases: matter that has no shape; the air we breathe contains several kinds of gases

cells: tiny units of living matter of which plants and animals are made

What Do Living Things Need?

How are you, a polar bear, and a corn plant the same? You, other animals, and plants are all living things. You all have the same basic needs—energy, water, gases from the air, space, and shelter. Still, living things meet these needs in different ways.

Energy

Your body, like a polar bear's body, turns the food you eat into energy. Cornstalks and other plants use sunlight to make their own food for energy. All living things need energy to live and grow.

Animals have different features that help them get food. Polar bears have sharp claws and teeth to hunt seals for food. Flamingos have long legs so they can find food in deep water. Elephants use their trunks to grasp branches and leaves.

Water

You know how you feel when you are thirsty. Other animals get thirsty, too. All animals need to drink water to survive. Plants also need water to make their own food for energy. All organisms must have water to stay alive.

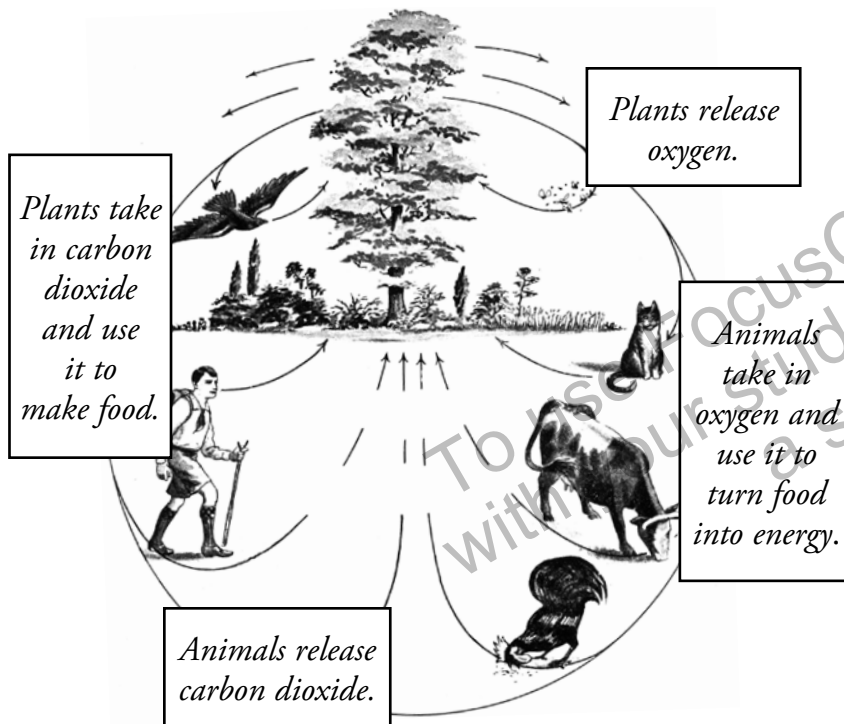
Camels that live in the desert can drink huge amounts of water at one time—up to 50 gallons in only a few hours! In the cooler season, camels may go up to seven months without drinking water. In comparison, people cannot survive without water after five days.

Gases From the Air

Oxygen and carbon dioxide are two of the gases in the air. Animals, including people, breathe in oxygen, which their bodies need. Animals breathe out carbon dioxide, which their bodies do not need. Through their leaves, plants take in carbon dioxide, which they need. Plants also release oxygen.

Frogs and toads get most of their oxygen the same way they get water—through their skin. Birds breathe through nostrils in their beaks. Fish breathe through **gills**.

Look at this diagram. Can you see how these living things help each other meet their needs?



gills: slits behind the eyes of fish and tadpoles; water moves in and out through these slits and the animal removes oxygen from the water

Space

Have you ever seen an aquarium that had way too many goldfish in it? Fish can't survive long under such conditions. Both plants and animals do not live well when they are crowded together. Just like you, other organisms need space to spread out. Otherwise, they get sick more often. They have to compete to get enough food, water, and sunlight.

Some animals need more space than others. For example, cheetahs need a large amount of space. Male cheetahs have their own territories, which can be up to 30 square miles. Honeybees can live in colonies with thousands of bees!

Shelter

Animals not only need space, but also shelter. Shelter protects them from bad weather and from larger animals. It gives them a safe place to have their babies and take care of them. A shelter might be a nest in a tree. It could be a hole in the ground. It could be an apartment in a tall building.

—Conclude—
*Which need can you do without for a short time?
Which need must be met all of the time?*

CHAPTER 2

The Cycle of Life

An animal can be as small as an ant or as huge as a whale. Still, every animal passes through four stages.

Fertilization/Reproduction

A new animal begins life when a cell from the female is combined with a cell from a male. Some females carry these new cells inside their bodies. For example, human babies begin life and grow inside their mother's body.

However, many females lay eggs outside their bodies. Some of the eggs are already fertilized by the male before they are laid by the female. That includes the eggs of all birds, **reptiles**, and insects. For other animals, the eggs are fertilized after they leave the female's body. These include many fish and **amphibians**. Some animals, such as birds, take care of their eggs until they hatch. Other animals, such as snakes, leave their eggs on their own.

reptile: a type of animal that lives on land and has a dry, scaly skin such as snakes, alligators, lizards, and turtles

amphibian: a type of animal that begins its life in water, breathing with gills and later may live on land, breathing with lungs

Birth

In time, the babies are born, or the eggs hatch. Many of the new animals look much like their parents, but they are smaller. Other young animals look nothing like their parents. You will learn about this second group later in the book.

Adulthood

Over a short or long period of time, the babies develop into adults. Adulthood can last a few hours for an insect or many years for a human.

Death

The last stage of life for all animals is death. By then, many animals have reproduced. That is, they have replaced themselves by having babies.

Some animals pass through these four stages of life in a few hours or days, while others take many years.

–Recall–

Explain the four stages animals pass through during their lives.

Metamorphosis

All animals grow and change, but they do it in different ways. For example, a kitten looks much the same as it will when it becomes an adult cat. It will still be the same color. It will have the same cute spot on its nose. It will still have four legs, two ears, a tail, and so on. Other young animals, such as robins and snakes, also look much like their adult forms.

However, some young animals look nothing like their adult forms. You probably know that some caterpillars turn into butterflies. Caterpillars change form as they develop into adult butterflies. Many other insects change form, too. This change is called a metamorphosis, which means “a change in form.”

metamorphosis: a change in form

Frogs and Toads

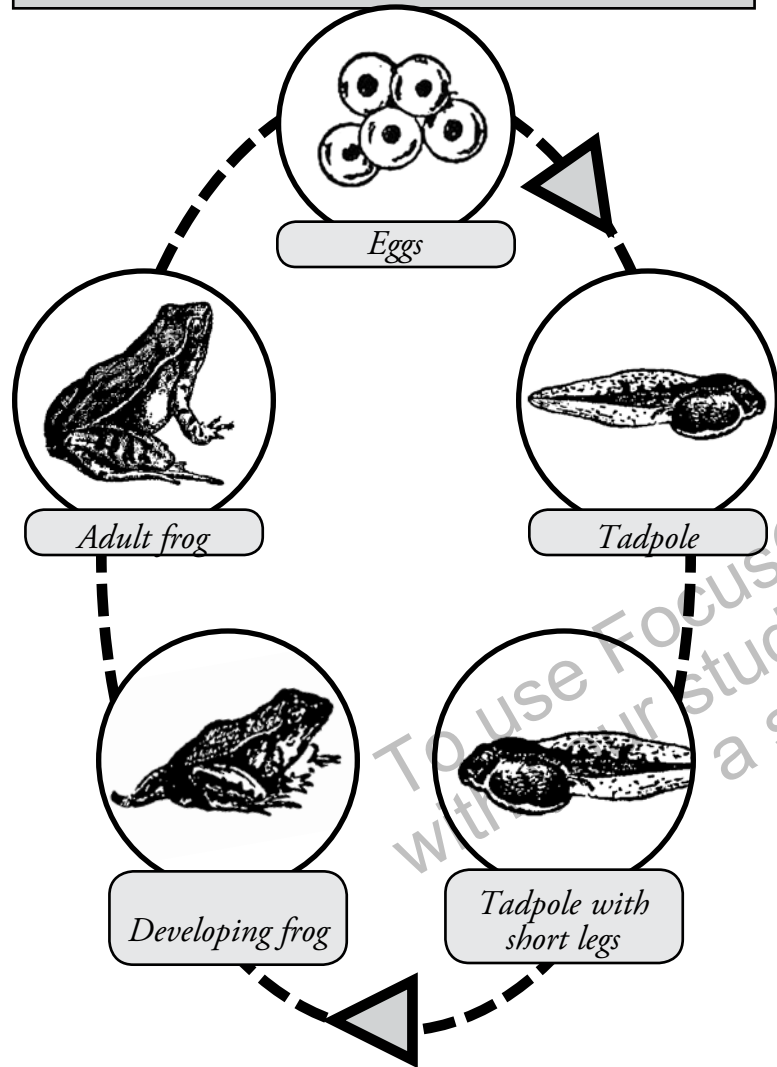
Frog and toad eggs do not hatch into tiny frogs or toads. Instead, they hatch into tadpoles. Then the tadpoles undergo metamorphosis as they change into adults.

You might have seen tadpoles in a pond or stream. Because they breathe through gills and have no legs, tadpoles look more like fish than frogs or toads.

Look at the diagram on the next page. You can see how a tadpole develops into a frog. As it grows legs, its tail begins to disappear. It also develops lungs so it can breathe air and live on land. After the frog becomes an adult, it looks for a mate. As the female lays eggs, the male fertilizes them. The **cycle**, or circle, of life begins again.

cycle: a period of time in which a series of events happens

Life Cycle of a Frog



*–Hypothesize–
How do you think scientists learned
about the life cycle of a frog?*

Three-Stage or Incomplete Metamorphosis

Insects have two types of metamorphosis. Some have a three-stage metamorphosis. Others have a four-stage metamorphosis.

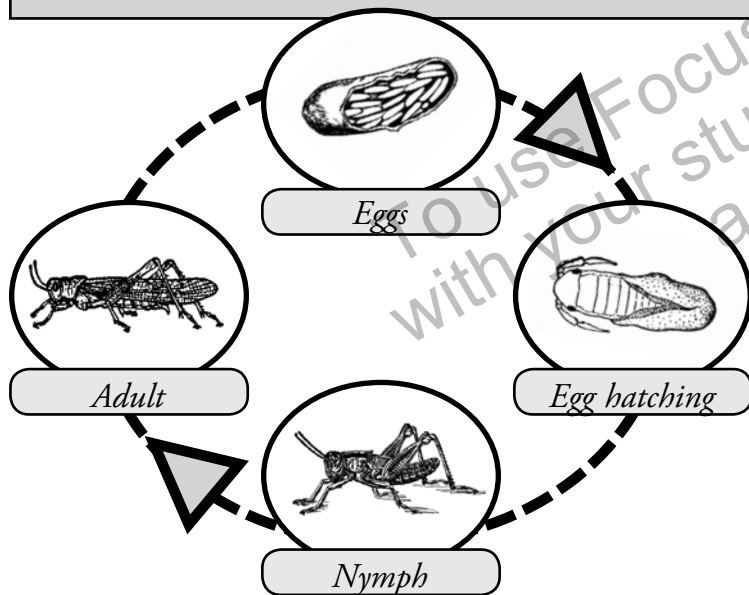
Grasshoppers, crickets, dragonflies, mayflies, cockroaches, cicadas, and termites all have a three-stage metamorphosis. This is also called simple or incomplete metamorphosis. What happens?

First, the egg hatches into a small insect. This young insect, called a **nymph**, looks much like its parents. A nymph usually does not have wings and may be a different color than the adult. It is not able to lay eggs or reproduce. It does eat the same food as the adult, however, and lives in the same place.

nymph: a young insect that looks like its parent

A nymph does not just grow larger, like a kitten. Instead, the nymph **molts**, or sheds its hard outer skin, and then a new, larger skin grows in its place. A nymph molts four to eight times, until it reaches its adult size. With each molt, its wings grow bigger. By its last molt, the insect can fly. After the adult insects mate, the female lays eggs to begin the cycle again.

Life Cycle of a Grasshopper (Incomplete Metamorphosis)



molt: to shed and replace an outer skin

Four-Stage or Complete Metamorphosis

Most insects, including butterflies and moths, go through a four-stage metamorphosis. They change from an egg, to a worm-like **larva**, to a **pupa**, to an adult insect. These insects look different at each stage in their life.

The insects in this group spend most of their time as larvae. (*Larvae* is the plural of *larva*.)

The larvae of many butterflies are caterpillars.

The larvae of flies are maggots.

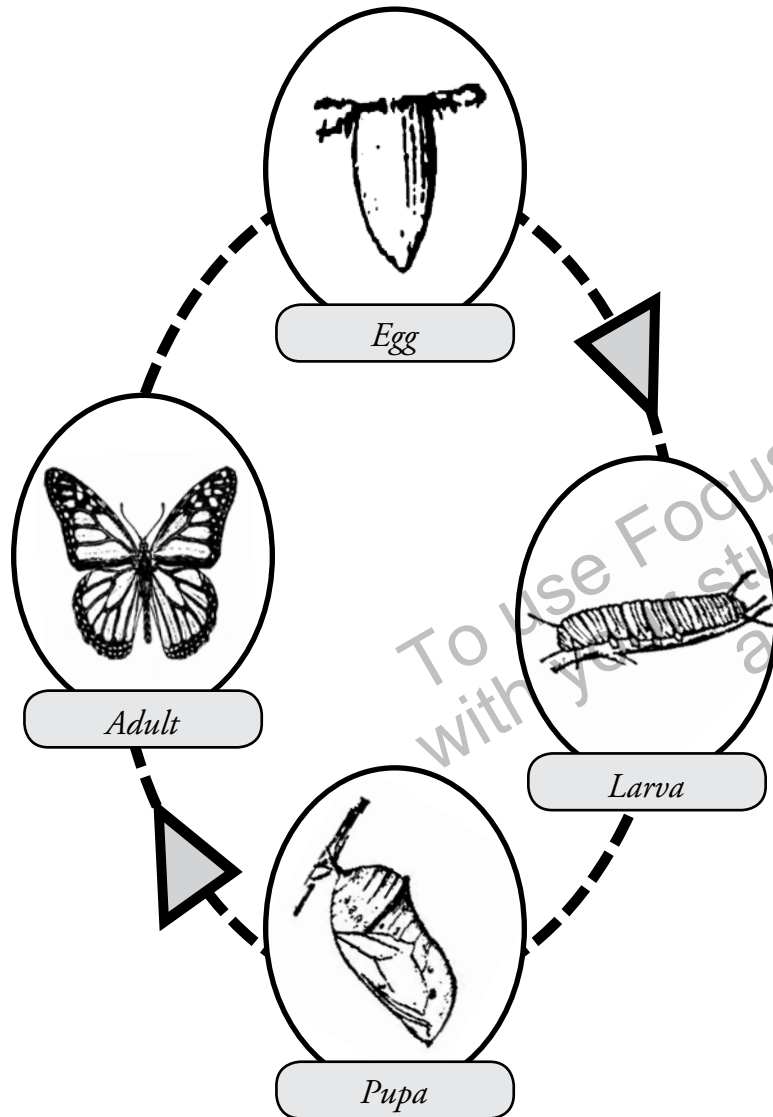
Like nymphs, larvae molt several times so they can grow larger. The larva and nymph stages are the only time when an insect grows larger.

A larva eats for several days or weeks. In one day, a larva can eat several times its weight in leaves or rotting food. Next, it attaches itself to a twig or leaf and creates a hard covering around its body called a cocoon. Now the insect has reached the pupa stage. It does not eat or move, yet inside the cocoon it is changing.

larva: a worm-like stage in metamorphosis

pupa: the stage in metamorphosis when the larva turns into an adult insect

Life Cycle of a Butterfly (Complete Metamorphosis)



For the next several days, weeks, or months, the pupa develops into an adult insect. First, much of its body becomes a liquid. The adult insect grows wings, legs, eyes, and other parts. A monarch butterfly develops from a larva to a butterfly in only two weeks!

After the adult insect is formed, the cocoon cracks open, and the insect crawls out. If it's a butterfly, it spreads its wings. That helps them dry and stiffen. Next, the insect looks for a mate. After two adult insects mate, the female lays eggs, and the cycle of life continues.

In addition to butterflies and moths, these insects go through a four-stage metamorphosis: flies, fleas, beetles, ants, mosquitoes, and bees.

As you can see, all animals grow and change. Some young animals just get bigger as they become adults, but frogs, toads, and many insects take on entirely new forms.

*–Summarize–
Compare the life cycles of a frog,
a grasshopper, and a butterfly.*

Traits of Animals

When animals are born or hatch, they have **traits** that they **inherited** from their parents.

Have you ever wondered why brothers or sisters look alike? They share inherited traits. Eye color is an inherited trait. So are height, shape of ears, and number of arms and legs. Inherited traits are characteristics that are passed from parents to their babies.

As animals pass through their life stages, they acquire new traits. For example, a lizard may lose part of its tail. This is an acquired trait. The lizard's babies will have tails of normal length. Scars are another acquired trait. Animals cannot pass scars on to their babies.

Think about it this way. An inherited trait is something an animal is born with. An acquired trait is something an animal learns or receives over time.

trait: a quality that distinguishes one living thing from another
inherit: to receive a trait from a parent

Inherited or Acquired?

Look at this list of traits. Which are inherited? Which are acquired?

- Knowing how to play the guitar
- Color of fur
- A loose tooth
- Having whiskers
- Patterns on a butterfly's wings
- A broken arm
- Number of toes



Study these two photos. Which traits did each girl inherit? Which traits did each girl acquire?

Glossary

amphibian—a type of animal that begins its life in water, breathing with gills and later may live on land, breathing with lungs

cells—tiny units of living matter of which plants and animals are made

cycle—a period of time in which a series of events happens

gases—matter that has no shape; the air we breathe contains several kinds of gases

gills—slits behind the eyes of fish and tadpoles

inherit—to receive a trait from a parent

larva—a worm-like stage in metamorphosis

metamorphosis—a change in form

molt—to shed and replace an outer skin

nymph—a young insect that looks like its parent

organism—a living thing

pupa—the stage in metamorphosis when the larva turns into an adult insect

reptile—a type of animal that lives on land and has a dry, scaly skin such as snakes, alligators, lizards, and turtles

trait—a quality that distinguishes one living thing from another

To Find Out More . . .

Want to learn more about life cycles of animals?

Try these books about life cycles by Bobbie Kalman

The Life Cycle of a Bird. Crabtree, 1997.

The Life Cycle of a Butterfly. Crabtree, 1997.

The Life Cycle of a Frog. Crabtree, 2006.

The Life Cycle of a Honeybee. Crabtree, 2006.

The Life Cycle of a Spider. Crabtree, 2002.

What Is a Life Cycle? Crabtree, 1998.

Access these Web sites

Fun information about butterflies

www.billybear4kids.com/butterfly/flutter-fun.html

The Amazing Adaptable Frog

www.exploratorium.edu/frogs/mainstory/index.html

Learn more about all kinds of insects

www.insecta-inspecta.com/bees/honey/index.html

Index

cocoon, 17, 19

four-stage (complete) metamorphosis, 17–19

larva, 17

life cycle of a butterfly (diagram), 18

life cycle of a frog (diagram), 14

life cycle of a grasshopper (diagram), 16

metamorphosis, 12–13, 15–19

needs of living things, 6–9

nymph, 15–16

oxygen/carbon dioxide cycle (diagram), 8

pupa, 17, 19

stages of life, 10–11

three-stage (incomplete) metamorphosis, 15–16

traits, 20–21

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Assessments

Life Cycles of Animals

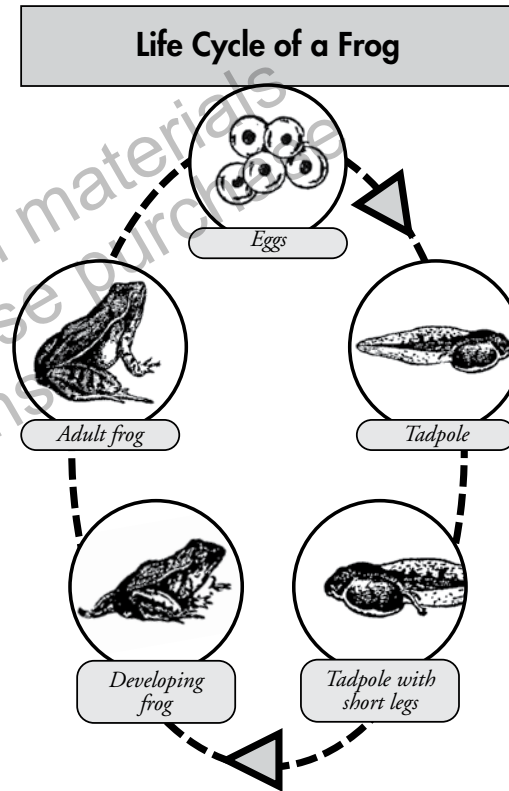
Print pages 20–22 of this PDF for the assessments.

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

1. Polar bears have thick fur and sharp claws, but elephants have no fur and flat toenails. This statement suggests that
 - Ⓐ different animals have different features
 - Ⓑ some animals are more advanced than others
 - Ⓒ animals acquire traits when they interact with their environment
 - Ⓓ animals pass through different life stages
2. An animal's eye color, height, and nose shape are examples of
 - Ⓐ life cycles
 - Ⓑ life stages
 - Ⓒ acquired traits
 - Ⓓ inherited traits

3. The diagram below shows the life cycle of a frog.



Based on the diagram, which statement is correct?

- Ⓐ A tadpole is a nymph.
- Ⓑ A tadpole changes to a pupa.
- Ⓒ A tadpole breathes through gills.
- Ⓓ A tadpole looks like an adult frog.

Check Understanding

4. All animals pass through four stages. The last stage is

- Ⓐ adulthood
- Ⓑ birth
- Ⓒ death
- Ⓓ fertilization/reproduction

Note that question 5 has only three choices.

5. The diagram below shows a cat.



Which characteristic did this cat inherit from its parents?

- Ⓐ a broken tail
- Ⓑ striped fur
- Ⓒ fleas

6. All insects under go metamorphosis, or a change in form. Identify the two types of insect metamorphosis.

(1) _____

(2) _____

7. Explain how the two types of metamorphosis are different.

Assessment Scoring Guidelines

1. Answer A is correct.
2. Answer D is correct.
3. Answer C is correct.
4. Answer C is correct.
5. Answer B is correct.
6. Three-stage incomplete metamorphosis and four-stage/complete metamorphosis.
7. In three-stage metamorphosis, the egg hatches into a small insect called a nymph. The nymph molts until it reaches its adult size. In four-stage metamorphosis, the egg hatches into a larva and molts. Then it creates a hard covering around its body and becomes a pupa. After some time, it changes into an adult.

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English Language Arts Activities

Life Cycles of Animals

Print pages 24–28 of this PDF for the reading activities.

Figure Out New Words

TRY THE SKILL

In this book, you learned many new words. Now you can use what you learned to figure out even more words.

For example, you learned the meaning of *reptile*: “a type of animal that lives on land and has a dry, scaly skin, such as snakes, alligators, lizards, and turtles.” So if the bad guy in a story looks “reptilian,” how does he look? Like a snake or a lizard!

Read the words and their meanings in the box below. Then answer the questions on the other side of this page.

amphibian—a type of animal that begins its life in water, breathing with gills and later lives on land, breathing with lungs

gases—matter that has no shape; the air we breathe contains several kinds of gases

metamorphosis—a change in form

organism—a living thing

1. A rock that was changed by heat and pressure is called _____.
Ⓐ amphibious
Ⓑ gaseous
Ⓒ metamorphic
Ⓓ organic
2. An army tank that can travel through the water is _____.
Ⓐ amphibious
Ⓑ gaseous
Ⓒ metamorphic
Ⓓ organic
3. A planet surrounded by clouds of hydrogen and helium is _____.
Ⓐ amphibious
Ⓑ gaseous
Ⓒ metamorphic
Ⓓ organic
4. Salt is a mineral, but a leaf is _____.
Ⓐ amphibious
Ⓑ gaseous
Ⓒ metamorphic
Ⓓ organic

Identify a Purpose

TRY THE SKILL

Knowing why something was written can help you understand it. These are the main reasons why an author writes:

- to give readers information
- to tell readers how to do something
- to persuade readers to think or act in a certain way
- to entertain readers

What is the main purpose of this book?

Most of this book was written to give you information. It tells about the different life cycles of animals. You are not expected to learn how to do something. You are not persuaded to think or act in a certain way. Yet the author hoped that the book would entertain, or interest, you. So the main purpose of this book was to inform, but a less important purpose was to entertain.

Read the description of each selection. Then identify its main purpose.

1. This selection tells how the pupa stage helps some insects survive very dry or cold weather.
 (A) to inform
 (B) to instruct
 (C) to persuade
 (D) to entertain
2. This selection urges readers not to collect cocoons, as they may prevent some insects from completing their life cycles.
 (A) to inform
 (B) to instruct
 (C) to persuade
 (D) to entertain
3. This selection outlines ways that readers can help monarch butterflies survive, such as planting milkweed.
 (A) to inform
 (B) to instruct
 (C) to persuade
 (D) to entertain

Check Understanding

Write the answer to each question in complete sentences.

1. Why don't people molt?

2. You find the larva of an insect. What are two ways that you could find out what kind of insect it is?

3. Is the three-stage or four-stage metamorphosis closer to the way humans develop into adults? Explain your answer.

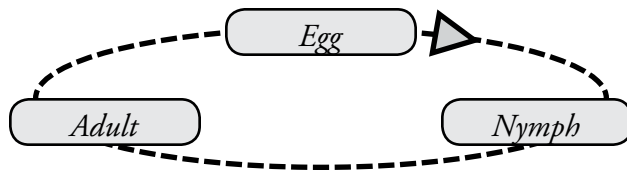
4. A tadpole and a caterpillar change forms as they develop into adults. How is a frog's life cycle different from a butterfly's?

Draw Conclusions from Diagrams

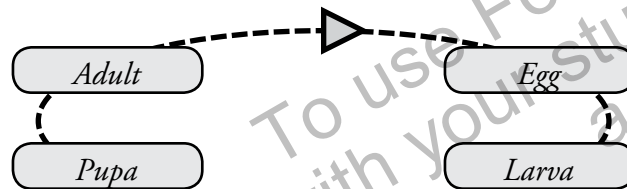
TRY THE SKILL

In this book, you learned about the life cycle of a grasshopper and a butterfly. You can use what you learned to draw conclusions from a diagram. Study the two diagrams below. They show two kinds of life cycles.

Incomplete Metamorphosis



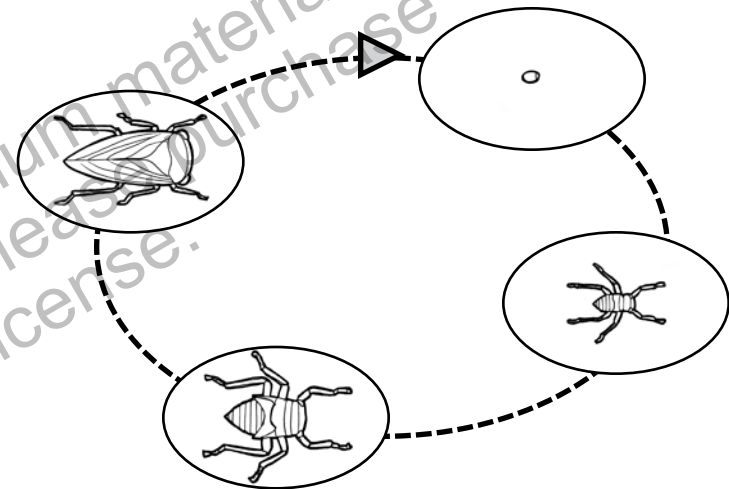
Complete Metamorphosis



Which cycle above describes a moth?

You have read that moths have the same life cycle as butterflies. Which cycle above is most like the butterfly cycle on page 18? The butterfly cycle includes a larva and pupa. So does the diagram of complete metamorphosis. That diagram is the one that shows the life cycle of a moth!

Now look at this drawing of an insect's life cycle. Study the two diagrams on the other side of the page. Decide which diagram shows this insect's life cycle. Explain your answer.



Answer Key

Figure Out New Words

1. C
2. A
3. B
4. D

Identify a Purpose

1. A
2. C
3. B

Check Understanding

1. People have a skeleton that grows with the rest of their bodies. Insects molt because their outside covering does not grow and has to be replaced.
2. Possible ways include letting the larva complete its life cycle, looking up the larva in a reference book, or asking a knowledgeable person.
3. Our development is more like a three-stage metamorphosis because young humans look much like adults, only smaller. Also, we have no larva or pupa stage.
4. A tadpole is a little like a larva, but frogs have no pupa stage.

Draw Conclusions from Diagrams

This drawing shows incomplete metamorphosis because the nymph looks much like the adult, only smaller. There is no larva or pupa.