

**FOCUS
ON
SCIENCE**

Adaptation and Survival

Advanced Level



Life Science
Reproduction, Heredity, and Evolution

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Adaptation and Survival

Scientific Inquiry

The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

Life Science

Individual organisms and species change over time.

The processes of sexual reproduction and mutation have given rise to a variety of traits within a species.

Changes in environmental conditions can affect the survival of individual organisms with a particular trait. Small differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors. Individual organisms with certain traits are more likely to survive and have offspring than individuals without those traits.

In all environments, organisms with similar needs may compete with one another for resources.

Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to permit its survival. Extinction of species is common. Fossils are evidence that a great variety of species existed in the past.

Many thousands of layers of sedimentary rock provide evidence for the long history of Earth and for the long history of changing lifeforms whose remains are found in the rocks.

Recently deposited rock layers are more likely to contain fossils resembling existing species.

Although the time needed for change in a species is usually great, some species of insects and bacteria have undergone significant change in just a few years.

Since the Industrial Revolution, human activities have resulted in major pollution of air, water, and soil. Pollution has cumulative ecological effects such as acid rain, global warming, or ozone depletion. The survival of living things on our planet depends on the conservation and protection of Earth's resources.



Adaptation and Survival

English Language Arts

The following is a selective listing of the competencies and indicators addressed in this book.

Word Recognition

- Use varied sources of information, including context, to monitor and self-correct for word-reading accuracy

Background Knowledge and Vocabulary

- Determine the meaning of unfamiliar words, terms, and idioms by using prior knowledge and context clues

Comprehension/Response

- Combine multiple strategies (e.g., predict/confirm, question, visualize, summarize, monitor, self-correct) to enhance comprehension and response

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How to Help Your Students Make the Best Use of This Book

Encourage students to develop nonfiction literacy skills by completing the Active Reader activities. Also encourage them to . . .

- Underline main ideas in paragraphs.
- Circle details that support the main ideas.
- Write down questions as they read.
- Circle key words as well as unfamiliar words.

Printing Instructions

Student Book: print pages 5–30

Assessments: print pages 33–34

Answer Key: print pages 35–38

FOCUS
ON
SCIENCE

Adaptation and Survival



**How does life on Earth
continue to adapt in response
to environmental change?**

All living creatures depend upon their environments for survival. Each individual **species** we find on the planet today has developed over millions of years in conjunction with their ever-changing environments. The result is plants and animals that flourish in a balanced coexistence and harmony with the world that surrounds them. Change to these environments happen in gradual and catastrophic ways. They can have lasting and sometimes deadly effects on the creatures that live there.

The challenge for scientists today is to understand better how environments are impacted by change and figure out what humans can do to keep any negative environmental impact to a minimum.

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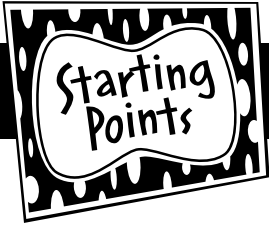
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Build Background

Predict

Food chains show how animals use other animals and plants as food sources. Describe some plants and animals that you think form a food chain.

Brainstorm

Earth is made up of countless habitats. A habitat is the natural environment of an animal or plant. Make a list of three things in your own habitat. Then list three things each in the habitat of a plant and animal of your choosing.

Your Habitat

Plant Habitat

Animal Habitat

Define

What does the word *extinct* mean? Write a definition and describe two different plants or animals that you know are extinct.

Define: _____

Explain: _____

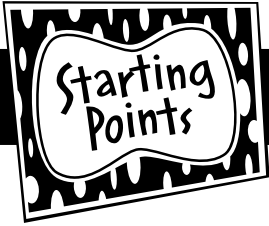


Key Vocabulary

Rate Your Knowledge

The words listed below have to do with environmental change. Each word is important, but some of them may be new to you. Rate your knowledge of each one by checking the appropriate column. Give the definition, if you know the word. After completing this book, come back to this page and write the definitions of words you did not know.

	I don't know it.	I've seen it, but I'm not sure what it means.	I know it well, it means...
species			
extinct			
ecosystem			
habitat			
herbivore			
carnivore			
photosynthesis			
fossil			
adapt			
population			
organic			
equilibrium			



Key Vocabulary

Use Roots to Unlock Meaning

Many science words come from Greek or Latin. Knowing Greek and Latin roots can help you unlock the meaning of many science terms. Circle the word in each sentence that contains the root.

photo-

1. Because film is photosensitive, it can only be developed in a dark room.
2. A photosphere is a layer of light that surrounds a star.
3. Plants turn light and water into a food source through photosynthesis.

eco-

4. My teacher loved plants and animals, so she studied ecology in college.
5. The oil spill was an ecohazard because of the damage it caused to marine life.

Multiple Meanings

Sometimes a word can have multiple meanings. These can be very different meanings depending how the word is used and what context it is referring to. Look up the following words in a dictionary. Note the number of different definitions there are listed for each word. Write down the definition you think best applies to the context of environmental change. Explain your choice.

1. *record*

Define: _____

Explain: _____

2. *harmony*

Define: _____

Explain: _____

Chapter 1 Extinction

FOCUS

This section describes what life was like during the time of the dinosaurs before they became extinct. Try to understand what extinction is and what happens to creatures that survive.

A Trip Into the Past

Imagine that you could close your eyes and travel back in time 65 to 144 million years to Earth's **Cretaceous Period**. You would open your eyes to see the sun rise on a humid tropical landscape. You'd notice moisture rising from the fronds of exotic plants as the morning sun heats up their leaves. You'd see ferns uncoiling to meet the daylight, moss covering the ground in the lush tropical forests, and tall palm-like trees growing high and straight into the sky.

In the air, all kinds of insects buzz and whirl: eating, mating, being eaten by birds. The ground also teems with life: worms, bugs, and reptiles of all kinds hunting, laying eggs, fertilizing the soil. Fish, amphibians, and insects **inhabit** the swampy rivers and bogs. In the distance, you hear bellowing roars. They give way to the awesome sight of prehistoric Earth's most amazing creatures—the dinosaurs.

ACTIVE READER

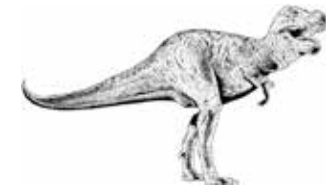
1 Illustrate Draw a picture of what you think Earth looked during the Cretaceous Period.



During the Cretaceous Period massive herbivores like the Rapetosaurus roamed Earth. They were longer than a school bus.



Triceratops warned off attackers with their armored heads and horns.



One of the deadliest of all the carnivores, the Tyrannosaurus Rex, had an upright body and razor sharp teeth.

What is Extinction?

Extinction occurs when all the members of a **species**, or group of related organisms, die off. In Earth's history, there have been several **mass extinctions** that have caused as much as 95 percent of the life on the planet to disappear. After each of these extinctions the plants, animals and other organisms that survive become the building blocks for all new life on Earth.

Now imagine you have jumped forward to a time about 65 million years ago. You see a totally different scene—all the dinosaurs are gone. They are extinct. They died in a mass extinction that occurred at the end of the Cretaceous Period. Birds, which are closely related to the **reptilian**

dinosaurs, and mammals did not die off completely. They barely survived the mass extinction, as did certain insects, fish, and amphibians.

Scientists have been working to find answers to questions about what happened at the end of the Cretaceous. What caused the dinosaurs to go extinct? Why did some species survive while others died off? The remaining chapters of this book will explore these mysteries.

FOCUS QUESTIONS

1. What is extinction?

2. What happens to the organisms that survive a mass extinction?

ACTIVE READER

1 Describe What happens during a mass extinction?

FOCUS

This section explains how scientists piece together what happened on Earth millions of years ago. As you read, think about how extinction and environmental change might be related.

Written in Stone

We know about the dinosaurs that roamed the planet from the fossil record. A fossil is the **petrified** remains of a plant or animal that is preserved inside the earth. They are usually found as a hardened skeleton or imprint in a rock or other geologic deposit.

Fossils take millions of years to form. Most of the fossils we find today formed when plants or animals died and were immediately covered in **sediment** or **organic material** like **tar**. Over time, these sediments piled up and hardened. Layer on top of layer became **compressed** and turned into rock or stone. The result can be a perfectly preserved record of what plants and animals looked like millions of years ago.

What Do Fossils Tell Us?

Fossil **evidence** can tell scientists all kinds of things from the size and shape of certain animals, to the kinds of plants that were on the planet. The fossil record is the combined results of all information from fossils found around the world. Scientists are constantly finding more fossils and adding new information to the fossil record. But based on the fossil evidence found so far, scientists have formed **theories** about what happened at the end of the Cretaceous Period that killed off the dinosaurs and about half of all other plant and animal species.



Fossil evidence can tell scientists about the plants and animals that inhabited Earth millions of years ago.

ACTIVE READER

1 Recall What does organic material come from?

2 Explain What does fossil evidence tell us?

Good to Know

Fossils aren't always found in rock. Many perfectly preserved insects and plants are found in amber. Amber is hardened fossilized tree resin. Millions of years ago insects, seeds, and plants would get caught in the sticky resin, and when the resin fossilized over millions of years, the specimens would remain trapped inside.

The Fossil Record

The sedimentary rocks under our feet have been laid down in layers over millions of years. Digging down through the layers is like taking a trip back in time. Younger rock sits atop older rock and the fossils contained in the various layers provide clues as to how species have changed over time. Scientists can also analyze the rock layers looking for clues about the composition of the seas and atmosphere at different times.

For example, the photograph below shows a clear break between the older, lighter colored rock below and the younger, darker colored rock above. In between these two layers, scientists have found a thin layer that has a high concentration of iridium, an element found in asteroids. This iridium layer has been dated to about 65 million years ago, at the same time as the extinction of the dinosaurs.

Other scientists have discovered a gigantic crater near Mexico's Yucatan Peninsula that suggests that something gigantic impacted Earth—also about 65 million years ago. Could this crater and iridium layer be evidence that a huge asteroid crashed into Earth and caused the extinction of the dinosaurs?



Erosion wears down Earth's surface revealing layers of sedimentary rocks deposited over millions of years.

ACTIVE READER

1 Research *What are asteroids and where do they come from? Write an explanation below.*

A Prehistoric Mystery

Scientists don't really know what happened to cause the dinosaurs and many other living things to become extinct. There are several theories. Some believe that a giant asteroid crashed into Earth and kicked up enough dust and debris to block out the sun. This radically changed Earth's environment because plants could no longer photosynthesize. Dinosaurs were herbivores, and so lost their food source.

Other scientists believe massive volcanoes erupted expelling enough heat and toxic gas to change Earth's atmosphere. Still others believe that a slow cooling of the world's climate changed Earth's temperature enough to make it uninhabitable for the dinosaurs. Whatever the cause, at the heart of each theory is the idea that widespread environmental change made it impossible for the dinosaurs to survive.

FOCUS QUESTIONS

1. What is one theory that explains how the dinosaurs became extinct?

2. What do all the theories explaining how the dinosaurs became extinct have in common?

Good to Know

The fossil record isn't a complete picture of life in prehistoric earth. That's because not all living creatures leave fossils. Earthworms, jellyfish, and organisms that don't have any kind of skeleton or hard shell don't fossilize. Scientists have to take this into account when they formulate their theories.

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Stop and Think

This page will help sum up what you have read so far. Use the tip to help you answer the question.

Occasionally, mass extinctions wipe out significant numbers of plants, animals, and other species. As a result, Earth is repopulated by the species that manage to survive. Use your knowledge of science to answer questions 1 and 2.

1. **What provides scientists with evidence that mass extinctions have occurred in the past?**

2. **How do scientists use the information they gather to determine what happened to cause these extinctions?**

3. **Which of the following statements about fossils best describes the way scientists can use them to gather information?**

- (1) Scientists can determine which species are now extinct.
- (2) Scientists can identify plants and animals in the fossils.
- (3) Scientists can read patterns of climate change in the rock.
- (4) Scientists can understand how Earth has changed over time.

Tip:

When you are asked to explain a process, think about causes and effects. Describe what happens first, second, and so on.

Dear Ms. Understanding,

I know fossils are really old, but when scientists find them it's not like they are buried with a calendar. How do scientists know the age of the fossils they find?



Befuddled in the Bronx

Dear Befuddled,

Scientists use several different tools and a lot of detective work to answer that question. One of the most important tools is called Radio



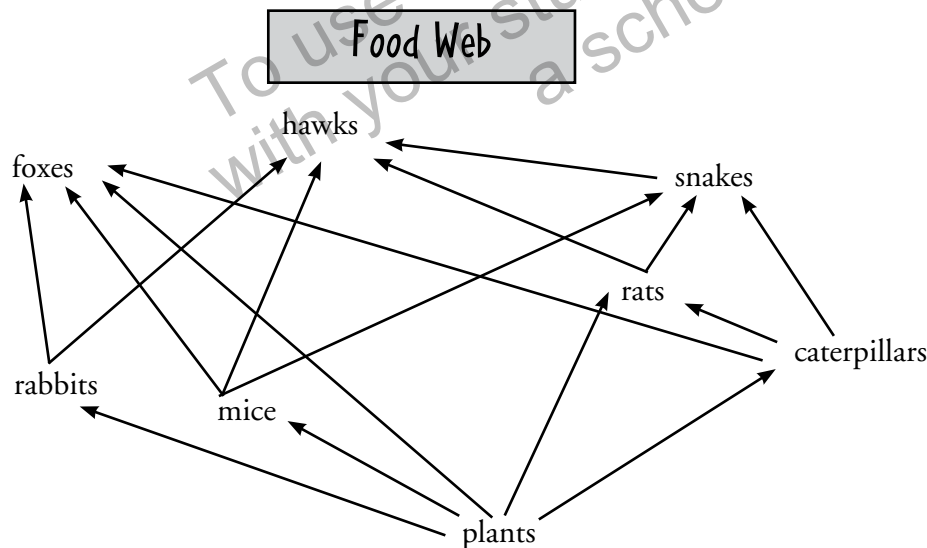
Carbon Dating. The remains of all plants and animals that eat those plants contain an isotope of carbon. This **isotope** breaks down, or decays, at a consistent rate. By measuring the levels of this isotope in an artifact and then calculating its level of decay, scientists can date it.

Ms. Understanding

Photosynthesis is a very important process because it is the origin of all the other food in the food chain. Other organisms eat photosynthesizing plants and use the plant's **carbohydrates** to fuel their own growth. These organisms are called **heterotrophs**. There are several different types of heterotroph, but they all have one thing in common: they survive by consuming other organisms as food. As soon as a heterotroph eats an autotroph, the food chain starts. It continues when the next heterotroph in the chain eats the first heterotroph. The chain continues until you reach the top of the food chain. When the top heterotroph, also called the top consumer, in a food chain dies, the energy stored in its body returns to the earth as the body **decays**.

Maintaining Equilibrium

Because many organisms eat more than one thing, food chains are connected to each other in food webs. Any time one organism eats another there is less energy available. This means that for the habitat to support life, there has to be more organisms at the bottom of the food chain than at the top. In the example below, there is significantly more plant material than rabbits, mice, rats, and caterpillars. There are more mice, rats, and caterpillars than snakes, and there are relatively few hawks and foxes compared with all the other organisms in the web.



ACTIVE READER

1 Contrast *What is the difference between an autotroph and a heterotroph?*

2 Infer *If all the snakes are killed it doesn't just affect the hawk population. What happens to the rat population?*

Now imagine that a nearby forest is cut down and many more hawks and foxes move in. Now there are twice as many predators as rabbits, mice, rats, and snakes. These predators will compete for the available food, eating it all until there is not enough left to feed them. This would cause the hawk and fox populations to leave the habitat or die off. The rabbit, mice, rat, and snake populations would at first decline, and then increase as the predator populations decline and **equilibrium** is achieved.

Ecosystems: An Interdependent System

When an ecosystem is in a state of equilibrium its inhabitants can live well and flourish. This is because there is enough food to encourage organisms to reproduce. At the same time there is enough competition for food between heterotrophs to keep populations from growing too large. This is the benefit of the interdependence between a habitat and the organisms that live in it.

The drawback of this interdependence is that if any part of the food chain or habitat is damaged or changed, it affects the equilibrium of the whole ecosystem. For example, if something happens to cause all of the grass to die off in a grassy meadow, all the other organisms that depend on it as a primary producer risk dying off as well.

FOCUS QUESTIONS

1. What can happen if a heterotroph population outgrows its food source?

3. Explain one drawback of the interdependent relationship between organisms and the ecosystem they live in.

ACTIVE READER

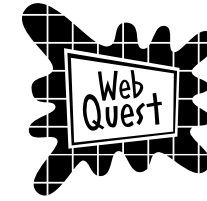
1 Paraphrase Explain why organisms benefit when an ecosystem is in a state of equilibrium.

Gradual change can also be human-made. When too much fertilizer is used on crops, the excess gets washed away into the water system. Once in the water, the fertilizer creates an overgrowth of algae in lakes and ponds. Too much algae on the surface of a pond can block sunlight to the plants below, killing a vital food source for insects and fish and upsetting the balance of the ecosystem.

Catastrophic change can also be natural or human made and it usually has a far greater impact on an ecosystem. Catastrophic change happens rapidly and often causes the total destruction of a habitat, with high casualties to the organisms living there. Examples of natural catastrophic changes are volcanic eruptions, tidal waves, floods, or massive storms like hurricanes. Human-made catastrophic changes occur as a result of oil spills, forest fires, flooding from river dams, draining of wetlands for agriculture and deforestation for raising livestock.



These birds died because of an oil spill. This was a human-caused catastrophic event.



Oil spills are probably one of the worst human caused catastrophic changes that can impact an ecosystem. Go online and research oil spills. Identify a major oil spill that happened in the past and write a brief summary explain what happened, where, and what's been done to clean it up.

FOCUS QUESTIONS

1. What is the main difference between catastrophic change and gradual change?

2. Explain how can too much fertilizer can cause change in a lake or pond.

FOCUS

This section explains how species respond to change. Pay attention to the key idea of adaptation.

Species' Response to Change

Species respond to different types of environmental change in different ways. When the environmental change is gradual, species have the opportunity to adapt in order to preserve the equilibrium of an ecosystem. To adapt is to change in order to survive in a new environment or condition. An adaptation is an inherited structure or behavior that allows the organism to respond to the environment and live to reproduce. The ability to adapt has been central to the survival of all species.

How Adaptation Works

When plant or animal species inhabits an environment, physical or behavioral traits help certain individuals survive in that habitat. When these individuals reproduce, their beneficial traits are passed on to their offspring, insuring that these offspring will have a higher survival rate for the environment. Individuals that don't receive these beneficial traits from their parents have less chance of survival. They may die before they have a chance to pass on their traits to any offspring. When this happens, any non-beneficial traits die with them.



Cacti adapted to the hot dry climate of the desert by storing water in their stems and by growing hair or spikes to avoid losing water through leaves.



The stick insect has adapted its appearance to look like a twig or stick. This camouflage allows it to hide from predators.

ACTIVE READER

1 Paraphrase Explain how adaptation works.

Web Quest

In 1859 Charles Darwin described a Theory of Evolution to explain how species of organisms are related and how

they change over time. He believed that through the processes of adaptation and natural selection, different species evolved from a common ancestor. The result is the wide variety of species of plants and animals we see on Earth today. Who was Charles Darwin? Look him up to find out more about who he was and how he developed the Theory of Evolution.

Species' Response to Gradual Change

For example, giraffes didn't start out with long necks; the species evolved into animals with unusually long necks because long necks helped them reach food high in the treetops. Once upon a time they may have had the same length necks as horses or zebras. But with heavy competition for food in the grasslands of Africa, the giraffes who had longer necks began feeding on the leaves of taller trees. The giraffes with the longer necks could reach more food and, because of this, flourished. These giraffes reproduced and passed their long necks on to their offspring. The giraffes with shorter necks couldn't reach as much food and died off at a greater rate before they could reproduce. This guaranteed that the genes for short necks were not passed on as frequently to the next generation of giraffe. Generation after generation, giraffes with long necks continued to reproduce until all giraffes are the long-necked variety we know today. This process is known as **natural selection**.

Species' Response to Catastrophic Change

In the case of catastrophic change where a habitat or a whole level of a food web is wiped out, organisms that survive need to adapt quickly. In this instance, highly opportunistic species are usually the first to colonize and repopulate an environment.

Opportunistic species are certain plants, planktons, bacteria, insects such as cockroaches, and small rodents such as mice and rats that can adapt quickly, reproduce quickly, and pass on beneficial traits to their offspring in order to survive in hostile environments. Bedbugs, for example, had not been much of a problem for humans for many years. But starting in about 2008, the bedbug problem was back. The species had been kept under control by the use of pesticides, chemicals that were poisonous to bedbugs. But bedbugs adapted so that the poison was no longer effective.



Cockroaches are an opportunistic species that can adapt quickly to hostile environments.

ACTIVE READER

1 Recognize List another animal that has a unique physical trait.

2 Infer How does this adaptation help its survival?

Good to Know

Darwin's theory of evolution through natural selection is commonly referred to as survival of the fittest.

Mystery Solved?

When we speculate about what happened to cause the extinction of the dinosaurs, we can tell from the fossil record that not all the organisms on Earth were wiped out at the same time as the dinosaurs. Scientists have found the remains of early ancestors of modern organisms like crocodiles, komodo dragons, turtles, birds, and different species of plants, insects, and the ancestors of modern mammals. In order to survive to become the species found on Earth today, these organisms must have adapted to their ever-changing environment.

But What About the Dinosaurs?

When it comes to the extinction of the dinosaurs, one thing is fairly clear: whatever the cause, at some point 65 million years ago, the dinosaurs failed to adapt to an environmental change. Whether it was an asteroid strike, an eruption, or simple a gradual change in climate, the dinosaurs failed to adapt to their environment. It is likely that something destroyed the dinosaur's food source. Most dinosaurs were plant-eaters and they were unable to get enough food or adapt their diet. Then, the meat-eating dinosaurs starved as well. Birds, mammals, and insects survived the catastrophe because their diet is more diverse, and they were able to adapt to the new conditions. The failure to adapt is the reason why the only dinosaurs left in Earth today are found in the form of fossils.

FOCUS QUESTIONS

1. Explain why only beneficial traits get passed along in natural selection.

2. What can happen when a species fails to adapt?

ACTIVE READER

1 Differentiate What is one key difference between how adaptive species reproduce and how opportunistic species reproduce?

Stop and Think

This page will help you summarize what you have read so far.

Tip:
Look back through the chapter to find key words in the questions and answer choices. Reread the sentences that contain those words.

1. Which of the following is a human-made catastrophic environmental change?

- (1) deforestation for agriculture
- (2) flooding from massive storms
- (3) destruction of coastal areas by a tsunami
- (4) devastation of towns and villages by an earthquake

Use the images below and your knowledge of science to answer questions 2 and 3.



2. The arctic fox's fur changes color depending on the season. Using what you know about adaptation, explain the benefit of this trait.

3. Through what natural process did the ability to change fur color become standard for the species?

Dear Ms. Understanding,

I've read that humans have evolved from ape-like creatures. Over time, we lost many of the traits that our ape-like ancestors must have had, like fur. We must have lost these traits through natural selection, but I thought natural selection only passed on traits that are helpful to a species? Does that mean being hairless is key to our survival?



Wondering in Watertown

Dear Wondering,

Natural selection doesn't just pass on traits that insure a species' survival, it can also eliminate traits that are no longer useful. At some point, fur was no longer necessary to human survival, and human ancestors with less hair survived as well as those with lots of hair. This allowed the hairless gene to be passed along until our ancestors started looking more like humans today.



Ms. Understanding



Adaptations Evidence of adaptation is all around us in the plants, animals, and people we see everyday. Pick one plant or animal. It can be a household pet like a cat or dog, an insect like a fly or spider, or a garden plant like a tree or flower. Study it closely. List four physical traits that are unique to your subject in the table below. Then list what you think each adaptive trait does and how it helps your subject survive. For example, you might list your cat's sharp claws. They help the cat hunt and kill its prey. This provides it with food for survival.

Observation Subject	Function	How it Helps Survival
Trait 1		
Trait 2		
Trait 3		
Trait 4		

Glossary

adapt – To change in order to survive in a new environment or condition.

autotroph - Any organism able to feed itself by transforming energy and inorganic materials into food.

carnivore – An animal that eats meat.

carbohydrate – A group of organic compounds that provide energy in the form of food for most animals.

catastrophic change – A sudden or widespread disaster characterized by death and destruction.

Cretaceous Period – A geological period on Earth 144 million to 65 million years ago.

compress – To press together under pressure.

decay – To breakdown or deteriorate.

deforestation – The process of removing trees and forests to claim land for other uses.

ecosystem – A system formed from the reaction between organisms and their environment.

equilibrium – A state of balance.

erosion – The wearing away of the surface of the earth by natural elements like water, wind, and ice.

evidence – An artifact or piece of information that is helpful in forming a conclusion.

evolve – To develop or undergo a gradual change.

extinct – To no longer be living or existing.

food chain – The order in which organisms feed off one and other.

fossil – The preserved remains of a plant or animal.

fossil record – The combined results of all information from fossils found around the world.

habitat – The natural environment in which an organism lives.

herbivore - An animal that eats vegetation.

heterotroph – An organism that consumes other organisms as food to create energy.

inhabit – To live in.

isotope – One of a group of atoms with the same number of protons but a different number of neutrons. For example, Carbon 12 has 6 neutrons and Carbon 14 has 8 neutrons. Both are isotopes of Carbon.

mass extinction – The large scale death of one or several species in a relatively short time frame.

natural selection – A process where organisms with traits that increase their chances of survival in an environment pass those traits on to their offspring, while organisms without beneficial traits die off before they can pass those traits on. This insures that beneficial traits are preserved and unhelpful ones die out.

Glossary

opportunistic species – A species with the ability to reproduce quickly and in large numbers, which allow them to quickly repopulate and adapt in situations of extreme environmental change.

organic material – Matter that results from the decay of once-living matter.

petrified – turned into stone in the process of petrification.

photosynthesis – A process where green plants or algae use energy from the sun to make energy-rich sugar molecules that can be used as food.

pond succession – The geological process that turns a pond into solid ground over time.

predator – An organism that survives by hunting and eating other organisms.

reproduce – To mate and give birth to offspring.

reptilian – like that of a reptile

sediment – Debris or matter that settles at the bottom of a liquid.

species – A group of organisms that are from the same family of plants or animals.

tar – A thick, sticky black substance created from the breakdown of organic materials like wood and peat.

theory – An idea formed by analyzing evidence to explain an occurrence.

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**FOCUS
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Adaptation and Survival

Assessments

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Check Understanding



In the Answer Document on this page, mark your answer in the row of circles for each question by filling in the circle that has the same number as the answer you have chosen.

1. How do scientists use the fossil record?

- (1) to prove how the dinosaurs became extinct
- (2) to find examples of all living things that ever lived on the planet
- (3) to gather evidence to help them form theories about the history of life on Earth
- (4) to gather information about soft, jelly-like animals such as worms, jelly fish, and slugs

2. What is a habitat?

- (1) a behavior unique to a certain animal
- (2) the environment in which a plant or animal lives
- (3) the temperature found in a certain environment
- (4) an area that includes a variety of ecosystems

3. Which statement explains why oil spills in coastal area are more destructive to habitats than oil spills far out at sea?

- (1) Oil spills far out at sea are easier to contain and clean up.
- (2) Fish tend to avoid oil spills when they occur far out at sea.
- (3) Coastal areas have more populations of plant, bird, and animal life than far out at sea.
- (4) Oil floats on the surface of the water and blocks photosynthesizing water plant's access to the sun's rays.

4. Which pair of words are synonyms?

- (1) producer, consumer
- (2) autotroph, producer
- (3) autotroph, consumer
- (4) heterotroph, producer

Answer Document

- | | | | | | | | | | |
|----|---|---|---|---|----|---|---|---|---|
| 1. | ① | ② | ③ | ④ | 3. | ① | ② | ③ | ④ |
| 2. | ① | ② | ③ | ④ | 4. | ① | ② | ③ | ④ |

Check Understanding



The photographs below show changes to the natural environment. Use them and your knowledge of science to answer questions 5 and 6.



an erupting volcano



oil spill



pond succession



the use of fertilizer on crops

5. Which photographs are examples of gradual change and which ones are examples of catastrophic change?

6. Which photographs show changes caused by natural processes and which show changes that are human-made?

**FOCUS
ON
SCIENCE**

Adaptation and Survival

Answer Key

Answer Key

Page 8: Build Background

Predict: Student answers will vary.

Brainstorm: Student answers will vary.

Define: Student answers will vary.

Page 9: Key Vocabulary

Rate Your Knowledge: Student answers will vary.

Page 10: Key Vocabulary

Use Roots to Unlock Meaning: 1. photosensitive; 2. photosphere; 3. photosynthesis; 4. ecology; 5. ecohazard

Multiple Meanings: Student answers will vary but should include some version of the idea that a record is a collection of data or evidence that can help prove factual information.

Page 11: Key Concepts

Active Reader: Answers will vary, but should include the idea that volcanic rocks or fossils containing volcanic ash can help prove that volcanoes existed on Earth millions of years ago.

Page 12: Chapter 1

Active Reader: Student's illustrations will vary.

Page 13: Chapter 1

Active Reader: One or more species die out in a relatively short period of time.

Focus Questions: 1. Extinction occurs when a group of organisms or an entire species dies off and no longer exists on the planet. 2. They become the building blocks of all new life on Earth.

Page 14: Chapter 1

Active Reader: 1. Organic material comes from decaying organisms that were once alive.; 2. Fossil evidence tells us about what Earth was like in the past.

Page 15: Chapter 1

Active Reader: 1. Asteroids are small planets and other space debris that orbit the sun, mostly between the orbits of Mars and Jupiter.

Page 16: Chapter 1

Focus Questions: 1. Responses may refer to volcanic eruptions, climate change, and asteroid strikes.; 2. All involve the idea that environmental change is responsible for extinction.

Page 17: Chapter 1

Stop and Think:

1. Scientists use the fossil record to determine these events.; 2. They use fossils to form theories about what life was like millions of years ago.; 2. (4)

Page 18: Chapter 2

Active Reader: Responses will depend on the student's surroundings.

Page 19: Chapter 2

Active Reader: 1. Autotrophs make their own food; heterotrophs rely on eating other organisms for food.; 2. The rat population will grow.

Page 20: Chapter 2

Active Reader: Organisms benefit because there is enough food, not too many predators, and reproduction is encouraged.

Focus Questions:

1. That heterotroph population will run out of food and the system will become imbalanced.; 2. A drawback is that changes in the food chain or habit can affect organisms negatively.

Page 21: Chapter 3

Active Reader:

1. Seeds sprout in pond. Plants grow attracting insects. Insect and plant waste build up on pond floor raising its level. More plants begin filling the pond into a swamp or marsh. Their roots connect and fill in until you have solid ground.

Page 22: Chapter 3

Focus Questions:

1. Catastrophic change happens quickly and gradual change happens slowly.; 2. It can cause algal bloom, which can block sunlight to organisms at the bottom of a pond or lake killing them off.

Page 23: Chapter 3

Active Reader: Descriptions will vary, but should match the explanation in text.

Page 24: Chapter 3

Active Reader: Answers will vary.

Answer Key

Page 25: Chapter 3

Active Reader: Opportunistic species reproduce quickly.

Focus Questions:

1. Traits that do not benefit the survival of a species make it harder for them to survive; this insures the unhelpful trait dies with that organism before it gets passed on to its offspring.; 2. The species can become extinct.

Page 26: Stop and Think

1. (1); 2. The arctic fox is a predator, so camouflage is necessary for it to sneak up on its prey.; 3. Like any adaptation, this trait would've developed through natural selection.

Page 27: Chapter 3

Hands on Science: Answers may vary.

Page 33: Check Understanding

1. (3); 2. (2); 3. (3); 4. (2)

Page 34: Check Understanding

5. An erupting volcano and oil spill are catastrophic. Pond succession and fertilizer use are gradual.; 6. Pond succession and volcanoes are natural. Oil spills and fertilizer use are human-made.

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