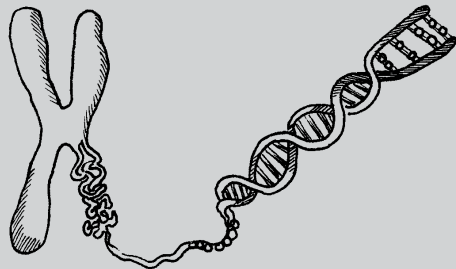


FOCUS
ON
SCIENCE

Reproduction and Inheritance

Basic Level



Life Science
Reproduction, Heredity, and Evolution

FOCUScurriculum



Reproduction and Inheritance

Scientific Inquiry

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

Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.

Life Science

The continuity of life is sustained through reproduction and inheritance.

Some organisms reproduce asexually. Other organisms reproduce sexually. Some organisms can reproduce both sexually and asexually.

There are many methods of asexual reproduction, including division of a cell into two cells, or separation of part of an animal or plant from the parent, resulting in the growth of another individual.

Methods of sexual reproduction depend upon the species. All methods involve the merging of sex cells to begin the development of a new individual. In many species, including plants and humans, eggs and sperm are produced.

Fertilization and/or development in organisms may be internal or external.

The male sex cell is the sperm. The female sex cell is the egg. The fertilization of an egg by a sperm results in a fertilized egg.

In sexual reproduction, sperm and egg each carry one-half of the genetic information for the new individual. Therefore, the fertilized egg contains genetic information from each parent.

In humans, the fertilized egg grows into tissue which develops into organs and organ systems before birth.

Another type of cell division accounts for the production of egg and sperm cells in sexually reproducing organisms. The eggs and sperm resulting from this type of cell division contain one-half of the hereditary information.

English Language Arts

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

Word Recognition

- Use word recognition skills and strategies quickly, accurately, and automatically when decoding unfamiliar words

Background Knowledge and Vocabulary Development

- Use self-monitoring strategies to identify specific vocabulary difficulties that disrupt comprehension, and employ an efficient course of action, such as using a known word base or a resource such as a glossary to resolve the difficulty

Comprehension Strategies

- Use a variety of strategies (e.g., summarizing, forming questions, visualizing, and making connections) to support understanding of texts read



Reproduction
and
Inheritance

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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

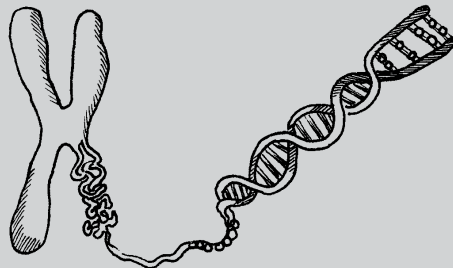
Student Book: print pages 5–28

Assessments: print pages 29–32

Answer Key: print pages 33–36

**FOCUS
ON
SCIENCE**

Reproduction and Inheritance



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

If you have siblings—brothers or sisters—you have probably heard other family members make comparisons like these:

“Jamal is going to be tall like his grandfather.”

“Amy is just like Aunt Jane. She’s usually shy, but comes alive when she plays the piano.”

Where do we get such characteristics as our height, our eye color, and our musical talent? Just like all living things, we inherit these characteristics from our ancestors, family members who came before us.

In the same way, we will pass on some of these characteristics to our children and grandchildren.

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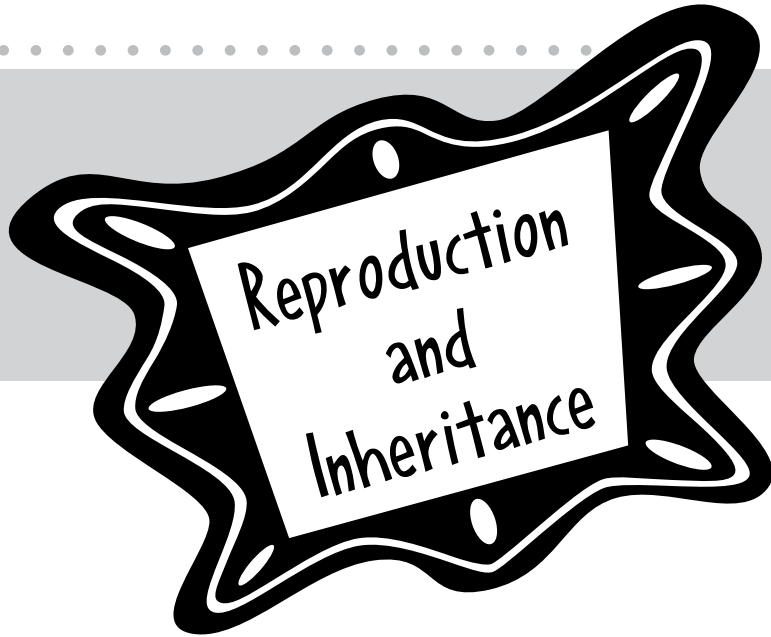


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Build Background

Use Your Knowledge

Biodiversity refers to the wide variety of living things on Earth. As you know, life on Earth depends on this variety. Explore what you know about living things. Read the passage. Do the activity that follows.

How varied are the organisms on Earth? There are almost a million different insects. There are a quarter million different plants. There are more than 4,000 different mammals. These organisms live in different habitats around the world. They can be as different as a mushroom, a jellyfish, and an elephant. But they are also alike in many ways.

Below are three organisms you might see in your backyard. Think about their physical and behavioral characteristics. List some ways they are alike and ways they are different.



Similarities

Differences



Key Vocabulary

Rate Your Knowledge

The words listed below have to do with reproduction and inheritance. Some of them may be new to you. Rate your knowledge of each by putting a check or a few words in the appropriate column. 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 . . .
biogenesis			
binary fission			
budding			
DNA			
fertilization			
gametes			
genes			
mimicry			
parthenogenesis			
runners			
trait			
vegetative propagation			
zygote			



Key Concepts

The Diversity of Life

In the past, many people used to believe that life could come from non-living matter. For example, people found maggots on rotting meat. They thought that the maggots formed out of the meat itself. They saw fish in ponds that had previously dried up. They thought that the mud at the bottom had given life to the fish.

Francesco Redi was an Italian scientist who lived in the seventeenth century. He was the first to use science to figure out if this was true. His experiments showed that maggots came from the eggs of living flies. The flies had just landed on the rotting meat. Redi's work led to the theory of **biogenesis**. This theory states that living things come only from other living things.



Some plants, like this star cactus, develop flowers that smell like rotting meat to attract flies. Flies lay their eggs on the flowers, maggots hatch, turn into adult flies, and spread the plant's pollen.

ACTIVE READER

1 Extend From which two words was the term *biogenesis* made? What is the meaning of each?

Good to Know

The relationship between flies and star cacti is called a commensal relationship because both organisms benefit. The fly gets a good safe place to lay its eggs, and the star cactus gets a way to spread its pollen.

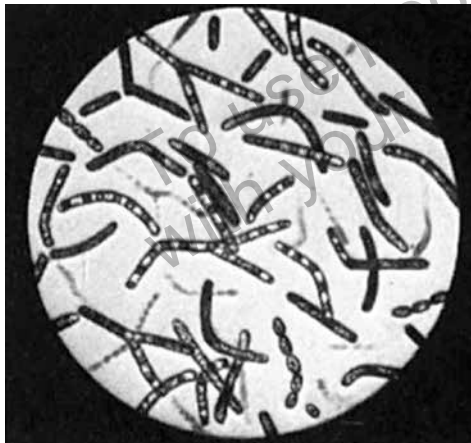


Key Concepts *continued*

Life has existed for more than 3.5 billion years. The first living organisms were single-celled and floated in the sea. Since those early days, life forms have changed and evolved.

Our environment is inhabited by living and non-living things. How are living things different from non-living things?

- They respond to their environment. They move.
- Chemical reactions within their bodies maintain their lives.
- They have a life span: they are born, they grow and develop, and they die.
- They reproduce and pass on traits to their offspring.



Scientists think that the first living thing on Earth was a single-celled organisms like the bacteria on the left. Today's world is filled with a great diversity of species, like the grasshopper on the right.

ACTIVE READER

1 Extend List some non-living things that living things depend on to stay alive.

Good to Know

Scientists used to think that almost all single-celled creatures were microscopic. Only a few types of large bacteria could be seen by the naked eye. But recently, a single-celled ocean creature has been discovered that grows to a width of 10 centimeters or more. It's called *Syringammina fragilissima*, which means "very fragile sand pipe." Others call it a living beach ball because of the way it looks underwater.

Chapter 1 Reproduction

FOCUS

The underlined sentences tell important ideas about reproduction. As you read this section, look for information about the two ways living things reproduce.

The Continuation of the Species

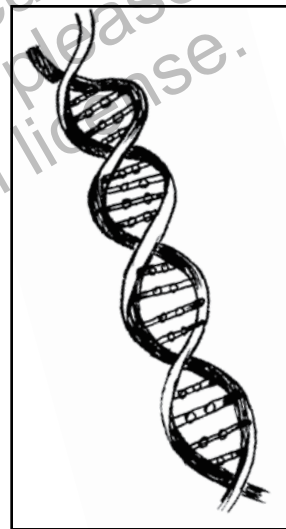
Living things eventually die. New individuals need to replace older individuals. If they don't, the species becomes extinction.

Reproduction is the process by which living things give rise to the same type of living things. There are basically two reproductive strategies: asexual reproduction and sexual reproduction. All living things use one or both of these strategies.

During reproduction, organisms pass on characteristics to their offspring. Another word for characteristics is **trait**. Traits are encoded in **genes** within each cell. Genes are short segments of a long molecule called deoxyribonucleic acid, or **DNA**. Each gene contains a chemical code that governs a trait or characteristic.

To reproduce themselves, some single-celled creatures split into two cells. This process is called **binary fission**. Each new cell is an exact copy of the original. It contains all the same genes that the original cell contained.

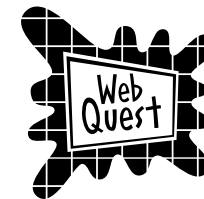
Binary fission is a form of asexual reproduction. By using asexual reproduction, creatures can make many copies of themselves quickly. They can take advantage of a good environment and populate a habitat quickly.



This segment of a DNA molecule is a gene that governs a specific trait. It looks like a twisted ladder.

ACTIVE READER

1 Identify According to the information on this page, what is one way single-celled creatures reproduce asexually?

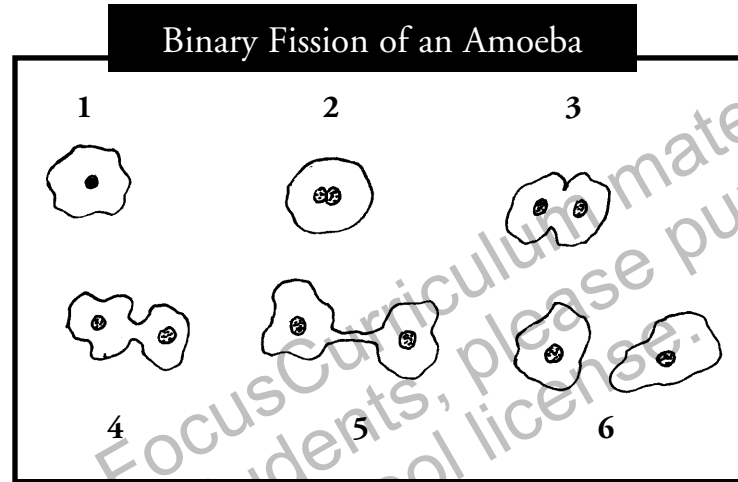


Search for and watch a video showing binary fission in a single-celled organism. Write a few sentences describing the process you observe.

The drawings at the right show how an amoeba splits using binary fission. An amoeba's DNA is contained in its nucleus, the dark center in the drawings.

First, the amoeba stops moving. It becomes round. The nucleus splits. Then the body splits. Two organisms are created. Each has its own nucleus and its own DNA.

The process of binary fission produces two individuals from one.



ACTIVE READER

1 Identify Underline the sentence that explains where genetic material is contained in a single-celled organism like an amoeba.

FOCUS QUESTIONS

1. What is genetic material made of?

2. What will happen to a species if the reproductive cycle for the species is stopped?

FOCUS

Read this section to find out more about asexual reproduction. Look for the different ways asexual reproduction can occur.

Asexual Reproduction

Bacteria, yeasts, some plants, and some invertebrate animals use asexual reproduction. However it happens in several ways. You have learned that an amoeba uses binary fission. Sea stars use a different strategy to pass on traits to their offspring.

Sea stars have five arms that grow out from a central body. They can actually release an arm, which will then grow into a complete adult sea star. A new arm will then regrow on the body of the parent.

Hydra live in fresh water. They have a tubelike body and a crown of tentacles. Hydra reproduce by **budding**. A small bud forms on the cell wall. It grows until it splits off. This bud then grows into a new adult hydra. In this way, the mother cell lives on, and a new daughter cell is created.

Geraniums and African violets grow new plants from part of a stem, root, or leaf. This is called **vegetative propagation**. If you put a leaf from a geranium into the soil, roots will grow to form a new plant.



Sea star regrowing a lost limb



Hydra budding

ACTIVE READER

1 Identify *Underline the sentence that lists different organisms that employ asexual reproduction.*

2 Question *A question about asexual reproduction I still need to answer is . . .*

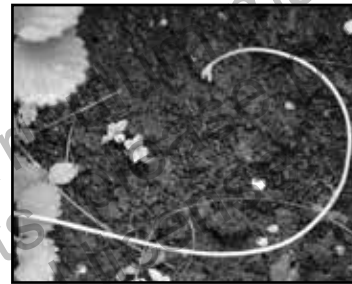
Some plants have special structures that are responsible for reproduction. The eye of a potato is an example. It is like a bud that will sprout a new potato. The new potato plant will be identical to its parent plant.

Strawberry plants send out **runners**. These are stem-like structures. New plants grow from the place where they touch the ground.

Asexual reproduction is efficient. It is a good way for a species to make many offspring. Each individual can reproduce. It doesn't take a male and female. Genes are not combined. All traits are passed on from the parent with no change. This can be a big advantage.



New potato plants sprout from eyes.



Strawberry plants send out runners.

FOCUS QUESTIONS

1. Explain how hydra reproduce asexually.

2. What are two techniques for asexual reproduction besides binary fission?

ACTIVE READER

1 Explain What are the benefits of asexual reproduction?

FOCUS

Read this section about sexual reproduction to learn the differences between DNA, genes, and chromosomes.

Sexual Reproduction

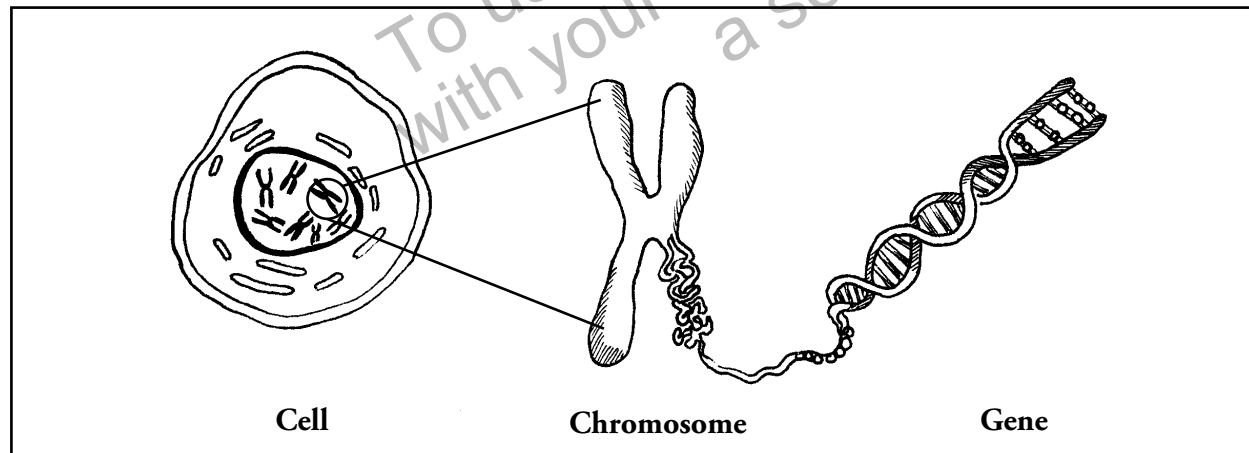
You have learned that sea stars can reproduce asexually. If a piece of one of a sea star's arms falls off, it can grow into a new sea star. But sea stars can also reproduce sexually.

Both the male and female produce special cells for reproduction. These are called **gametes**. A gamete can fuse with another cell. This happens during **fertilization**.

Genetic Information

Cells contain genetic information. This information is encoded in a DNA molecule. A DNA molecule is long and twisty. A gene is a piece of the DNA molecule. Each gene contains the instructions for a specific trait. Genes are packed in bundles called **chromosomes**. Humans have 23 pairs of chromosomes, for a total of 46.

Gametes are unusual cells. Instead of containing all of the chromosomes found in other cells, gametes contain only half the chromosomes.



Chromosomes contain the long, twisty DNA molecule that consists of genes linked together.

ACTIVE READER

1 Identify Underline the sentence that best states the main idea of the second paragraph.

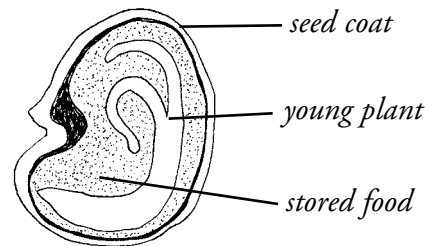
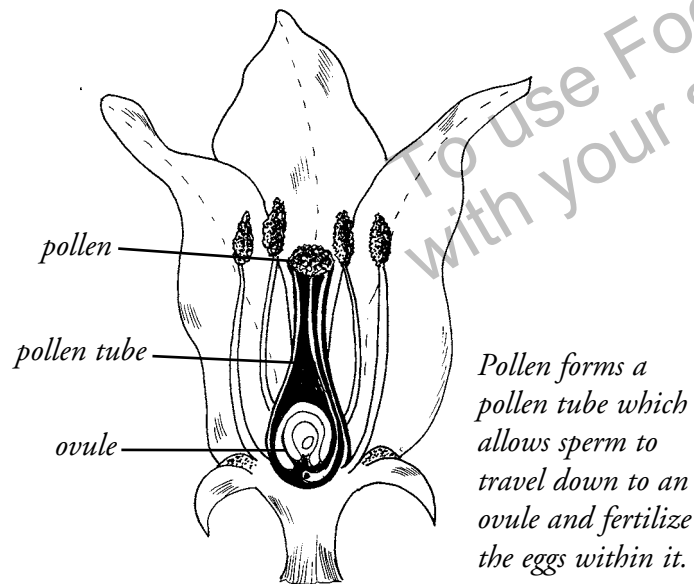
2 Explain What makes a gamete different from other cells in the body?

Gamete + Gamete = Zygote

The female gamete is the egg. The male gamete is the sperm. Egg and sperm combine to create a **zygote**. A zygote has a complete set of genetic information. Half comes from the male and half from the female. Now the cell can start to divide. It divides again and again. Eventually, it develops into a new individual. This new individual can create its own gametes.

Gametes are created through meiosis. During this process, the number of chromosomes in a cell is cut in half. Some interesting and important things can happen. Sometimes a gene is altered. The new individual who develops will have some genes that are slightly different from its parent's genes. The new individual will be a lot like its parents. But, it will differ in some ways.

Seed plants can also reproduce sexually. They have cones or flowers. Female cones and flowers contain ovules. Male cones and flowers produce pollen. Eggs develop in ovules. Sperm develop in pollen. A zygote forms when sperm fertilizes an egg. After fertilization, the ovule becomes a seed.



ACTIVE READER

1 Explain Explain in your own words what happens during fertilization to create a zygote.

Every once in a while, a gene is altered when a gamete is formed during meiosis. Because of this, those species that reproduce sexually have an advantage. The advantage is that new traits can evolve that never existed in the species before.

How does this help a species? Suppose something threatens the species with extinction. There are likely to be a few members of the species around with changed genes. Those individuals might have just the right new traits needed to handle the threat. If so, they will survive and live to pass on their genes to their offspring.



Climate change could spell disaster for the polar bear unless some members of the species have the traits they need to adapt to the new environment.

FOCUS QUESTIONS

1. Which word or phrase means the same or almost the same as zygote?

- (1) trait
- (2) gamete
- (3) fertilized egg
- (4) vegetative propagation

2. How many chromosomes do human cells have? _____

ACTIVE READER

1 Recall What is the difference between a gamete and a zygote?

Stop and Think

This page will help sum up what you have read so far.

1. Which list is arranged from smallest to largest?

- (1) chromosome, gene, egg cell, zygote
- (2) egg cell, gene, chromosome, zygote
- (3) zygote, gene, egg cell, chromosome
- (4) gene, chromosome, egg cell, zygote

2. Which of these processes results in an individual with different traits than its parents?

- (1) budding in hydra
- (2) parthenogenesis in fish
- (3) binary fission in bacteria
- (4) zygote formation in insects

3. What are the two types of gametes?

4. What happens during the formation of a zygote?

Dear Ms. Understanding,

I think I understand the differences between asexual and sexual reproduction. In asexual reproduction, one individual creates an offspring. In sexual reproduction, it takes a male and a female. And, offspring from sexual reproduction are bigger, stronger, and healthier, right?



Got It Down in Delphi

Dear Got It Down,

Well, the first part of your statement is correct, but not the second. Offspring that result from asexual reproduction can be just as big, strong, and healthy as offspring produced by sexual reproduction.



Ms. Understanding

Chapter 1 Inheritance

FOCUS

The underlined sentences below tell important ideas about heredity. Read this section to find out more about how organisms acquire their traits.

Parents and Their Offspring

Passing on traits from parents to their children is called heredity. Physical traits, such as hair color and eye color, are passed on through genes. So, at a very early stage in development, physical traits have been established. They are coded by way of the individual's genes.

However, an individual's traits are also affected by environment. Height is a good example of a trait that is affected by both heredity and environment. An individual may have tall parents and inherit the tendency to be tall. But the quality of the food he or she eats during childhood also affects height.

Another example is friendliness. A person inherits the tendency to be talkative and interested in other people. That person may be generous and helpful. However, life may also lead a person to be shy and less likely to be friendly.

Most traits are affected by both heredity and environment. One may play a larger role than the other. But both are important in determining traits.



Traits are affected by heredity and environment.

ACTIVE READER

1 Analyze Which best describes how paragraph 2 is organized?

- a sequence of events
- a statement followed by an example
- a list of related items
- a comparison of two things

2 Recognize Write a G in front of traits that might be mostly affected by genes. Write an E before traits that might be mostly affected by environment.

- eye color
- strength
- 20/20 vision
- weight

Adaptations Over Time

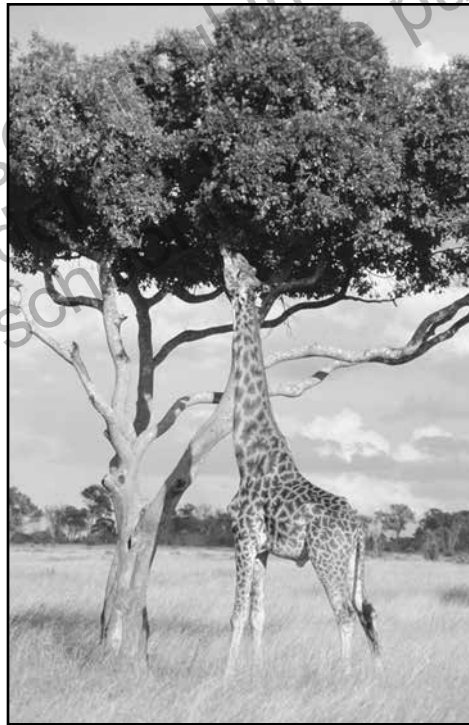
In Chapter 1, you read that genes can be changed when gametes form. Genes can also change when DNA is not copied exactly. This second type of change is called a **mutation**.

A mutation is a permanent change. It can be passed on to offspring. Any change in the DNA of offspring can cause new traits to appear in a population. These new traits are called variations.

Some variations are harmful and some have no effect. However, some can be helpful. Helpful variations make an individual stronger. They may be better at getting food or hiding from predators. They may be better able to handle a harsh climate. They are more fit for their environment. They can better survive to pass on their genes.

Over time, more and more offspring inherit this adaptation. Other adaptations occur. Eventually a new species may evolve.

For example, giraffes and horses both evolved from an animal that lived millions of years ago. Tall members of this species survived by eating the leaves at the tops of trees. Those individuals with long necks were more successful. They reproduced and passed their long necks on to their offspring. Eventually, the giraffes became a separate species.



Tallness in giraffes is an adaptation that allowed the species to survive.

ACTIVE READER

1 Recall *What can be the effect of a variation that is helpful to an organism?*

2 Order *Put these three in their proper sequence:*

variation
mutation
adaptation

Camouflage is a good example of an adaptation. Some animals can change the way they look to match their changing surroundings. Chameleons and cuttlefish are examples. Others don't try to hide at all. They have evolved to look like another organism that predators would avoid. This type of camouflage is called **mimicry**. For example, the walking stick insect might be tasty to a frog. But a frog would avoid it because it looks just like a twig.



The appearance of the walking stick insect mimics that of a twig.



Animals have adapted to their environments in many unusual and interesting ways. Search the Web to find the most fascinating

examples. List them under headings such as these:

Adaptations for food gathering

Adaptations for reproduction

Adaptations for defense against predators

FOCUS QUESTIONS

1. How does a mutation occur?

2. Explain how a mutation in a gene can lead to an adaptation that affects an entire species.



All in the Family Do you look more like your mother, father, grandmother, or grandfather? Where do your traits come from? Fill in the chart below about yourself by circling the physical traits you have. Then choose two other family members and complete the chart about each of them. Write a sentence or two comparing your inherited traits with theirs.

Yourself	Family Member #1	Family Member #2	Comparison
curly hair	curly hair	curly hair	
straight hair	straight hair	straight hair	
hair on fingers	hair on fingers	hair on fingers	
no hair on fingers	no hair on fingers	no hair on fingers	
widow's peak	widow's peak	widow's peak	
no widow's peak	no widow's peak	no widow's peak	
can curl tongue	can curl tongue	can curl tongue	
can't curl tongue	can't curl tongue	can't curl tongue	
cleft chin	cleft chin	cleft chin	
smooth chin	smooth chin	smooth chin	
smile dimples	smile dimples	smile dimples	
no smile dimples	no smile dimples	no smile dimples	
attached earlobes	attached earlobes	attached earlobes	
free earlobes	free earlobes	free earlobes	

FOCUS

This section discusses how helpful adaptations develop in species that reproduce asexually.

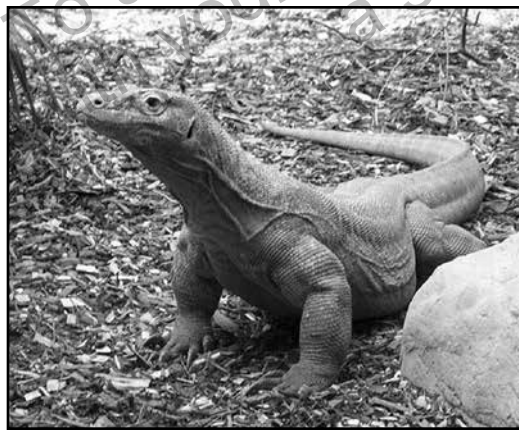
Adaptation and Asexual Reproduction

In asexual reproduction helpful mutations also occur. These can lead to variations. But, it takes a long time for the changed genes to spread through a population.

Asexual reproduction works well for species that live in a stable environment. They don't need to change much in order to survive. It is a way for them to reproduce quickly. They can build a large population in a short period of time. Bacteria, sponges, and some plants use this to their advantage.

However, with asexual reproduction there is less genetic diversity in a population. Therefore, the risk of extinction is greater. If all members of a species have the same traits, environmental changes, could wipe them all out.

Some organisms, even large ones, can reproduce either asexually or sexually. Because of this, their species can benefit from the advantages of both systems. Aphids, certain bees, some sharks, and komodo dragons are all creatures that have this ability.



What do strawberries and komodo dragons have in common? Both can reproduce sexually and asexually.

ACTIVE READER

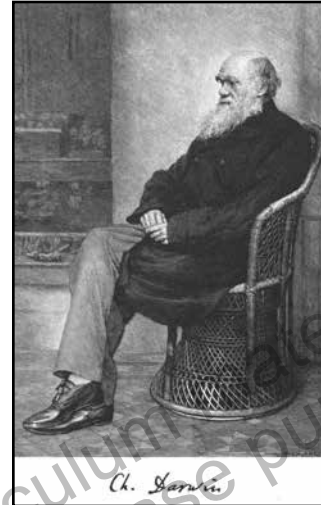
1 Identify Underline two sentences that list examples of organisms that can reproduce asexually.

Natural Selection

Natural selection is a theory developed by Charles Darwin in the mid-1800s. He observed different types of finches on the Galapagos Islands. These islands are off the coast of South America.

The theory states that organisms with the traits best suited to their environment are more likely to reproduce. They will be the ones to pass on these traits to their offspring. These helpful traits may be physical or behavioral.

“Survival of the fittest” is often used to explain natural selection. Over time, the offspring of individuals with helpful adaptations will become a larger and larger part of the population. When they are different enough from other populations in the area, they become a separate species. Natural selection is the process that drives evolution.



Charles Darwin developed the theory of natural selection.

ACTIVE READER

1 Explain Give an example of a physical trait and a behavioral trait.

physical trait _____

behavioral trait _____

FOCUS QUESTIONS

- Female hammerhead sharks usually reproduce sexually, but they can also reproduce asexually. When might this be an advantage?

- List the terms below in sequence.

gene mutation

adaptation

new species

variation

Stop and Think

This page will help sum up what you have read so far. Keep the tip in mind as you study for tests.

Tip:

Study for tests over a few days or weeks, and continually review class material. Don't wait until the night before and try to learn everything at once.

1. Which two factors directly affect an individual's traits?

- (1) interests and education
- (2) mutations and species variation
- (3) inherited genes and environment
- (4) adaptations and natural selection

2. During which process do changes in a gene occur?

- (1) adaptation
- (2) fertilization
- (3) zygote formation
- (4) gamete formation

3. Which of the following processes drives evolution?

- (1) parthenogenesis
- (2) natural selection
- (3) sexual reproduction
- (4) asexual reproduction

Dear Ms. Understanding,

I have red hair, just like my grandfather. But my mom and dad both have dark brown hair. So whose genes did I get?



Ruddy in Rensselaer

Dear Ruddy,

Remember that your genes came from both your mom and dad. Each gene from your mom paired up with its partner gene from your dad to produce a trait in you. In humans, hair color is actually determined by a variety of genes. So your red hair was produced by combinations of many genes from both your mom and dad. So why do you share red hair with your grandfather? Remember how heredity works. The genes that your parents passed down came from their parents. So, some of the genes that caused your grandfather's red hair could also be causing yours.



Ms. Understanding

Glossary

biogenesis – the theory that states that living things come only from other living things

binary fission – a type of asexual reproduction in single-celled organisms in which the original cell splits to produce two identical daughter cells

budding – a type of asexual reproduction in which a bud forms, grows, and splits from the parent to become a new individual that is identical to the parent

DNA – deoxyribonucleic acid; a molecule found in cells that contains the genetic instructions used by all living things

fertilization – the fusion of gametes to create a zygote, which develops into a new organism

gametes – special cells that are responsible for reproduction; a cell that has the ability to fuse with another cell during fertilization.

genes – the basic unit of heredity; genes are made of DNA and act as instructions to make proteins.

mimicry – a type of camouflage in which an organism exhibits the physical traits of another organism for its protection

parthenogenesis – a type of asexual reproduction in which offspring are produced by the female from unfertilized eggs

runners – stemlike parts of certain plants, such as strawberries, that send them arching out to touch the ground several inches away and propagate an identical daughter plant

trait – a characteristic of an organism

vegetative propagation – the propagation of a new plant from a part of an existing one

zygote – a cell created by sexual reproduction from the fusion of male and female gametes; a zygote can develop into a new organism

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**FOCUS
ON
SCIENCE**

Reproduction and Inheritance

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.

- Which reproductive strategy spreads new adaptations through a population most quickly?
 - budding
 - binary fission
 - sexual reproduction
 - asexual reproduction
- Where is DNA found in any multi-celled organism?
 - buds
 - pollen
 - bacteria
 - cell nucleus

The reproductive success of the walking stick shown below depends in part on its camouflage. Use the picture and your knowledge of science to answer questions 3 and 4.



- What type of camouflage does the walking stick employ?

- How could camouflage enhance the walking stick's reproductive success?

Answer Document

1. ① ② ③ ④ 2. ① ② ③ ④

Check Understanding



The arctic fox in the picture at the right has thick fur on its body and between the pads of its feet. Arctic foxes are nomadic, meaning that they move from place to place rather than living in an exclusive territory.



For items 5 and 6, identify if the trait is mostly due to heredity or environment. Then explain the advantage that the trait offers the animal.

5. Trait:
Thick fur, including between the pads of the feet.

Identify:

Explain:

6. Trait:
Moves from place to place.

Identify:

Explain:

**FOCUS
ON
SCIENCE**

Reproduction and Inheritance

Answer Key

Answer Key

Page 8: Starting Points:

Build Background

Use Your Knowledge: Sample answers:

Similarities: All have a body with four limbs, all are predators, all have two eyes.;

Differences: Each has a different body covering; each uses a different form of locomotion; birds live in the air, cats on the ground, and frogs in water.

Page 9: Starting Points

Key Vocabulary

Rate Your Knowledge: Answers will vary according to the student's prior knowledge.

Page 10: Starting Points

Key Concepts

Active Reader: 1. bio means life; genesis means beginning.

Page 11: Starting Points

Key Concepts

Active Reader: 1. air, water, shelter

Page 12: Chapter 1

Active Reader: 1. binary fission

Page 13: Chapter 1

Active Reader: 1. In the first paragraph, underline: An amoeba's DNA is contained in its nucleus.

Focus Questions: 1. DNA; 2. Extinction will result.

Page 14: Chapter 1

Active Reader: 1. In the first paragraph, underline: Bacteria, yeasts, some plants, and

some invertebrate animals employ this strategy for reproduction.; 2. Responses will vary depending on the students' questions.

Page 15: Chapter 1

Active Reader: 1. Asexual reproduction is efficient. It is a good way for a species to make many offspring. Each individual can reproduce. It doesn't take a male and female. Genes are not combined. All traits are passed on from the parent with no change.

Focus Questions: 1. Hydra reproduce by budding. A small bud forms on the cell wall. It grows until it splits off. This bud then grows into a new adult hydra.; 2. budding, vegetative propagation, sending out runners, parthenogenesis

Page 16: Chapter 1

Active Reader: 1. Underline: Cells contain genetic information; 2. Gametes contain only half the chromosomes of other cells.

Page 17: Chapter 1

Active Reader: 1. Sample answer: During fertilization, gametes join together, or fuse, to create a cell that has a complete set of chromosomes.

Page 18: Chapter 1

Active Reader: 1. A gamete is a male or female cell, a zygote is a fusion of two gametes, one male and the other female.;

Focus Questions: 1. (3); 2. 46

Page 19: Chapter 1

Stop and Think: 1. (4); 2. (3); 3. There are two types of gametes: male and female.; 4. During fertilization they fuse to create a cell with a complete set of chromosomes that can develop into an adult organism.

Page 20: Chapter 2

Active Reader: 1. statement followed by example; 2. G-hair color; E-strength; G-20/20 vision; E-weight

Page 21: Chapter 2

Active Reader: 1. A helpful variation in an individual can develop into an adaptation across the entire species.; 2. mutation, variation, adaptation

Page 22: Chapter 2

Focus Questions: 1. Mutations occur when DNA is not copied exactly during the formation of a new cell.; 2. If a gene mutation occurs in a gamete, and it leads to a helpful trait in offspring, then that offspring will have a better chance of passing on the gene to its offspring. The more offspring who receive this helpful gene, the more widespread throughout the population the trait will become. Eventually, all individuals who are members of the species will have this gene and the associated trait.

Page 23: Chapter 2

Hands On Science: All in the Family: 1. Responses will vary.

Answer Key

Page 24: Chapter 2

Active Reader: 1. Underline these two sentences: Bacteria, sponges, and some plants use this to their advantage. Aphids, certain bees, some sharks, and komodo dragons are all creatures that have this ability.

Page 25: Chapter 2

Active Reader: 1. Examples: Physical traits: hair color, eye color; Behavioral traits: fidgets, shy around new people

Focus Questions: 1. This could be an advantage if there are no males around.; 2. gene mutation, variation, adaptation, new species

Page 26: Chapter 2

Stop and Think: 1. (3); 2. (4); 3. (2)

Page 31: Assessments

Check Understanding 1. (3); 2. (4); 3. mimicry 4. The walking stick is very hard for its predators to detect because it blends so well with its background. It looks just like an unappetizing stick. In this way, it is likely to live longer and have a chance to reproduce.

Page 32: Assessments

Check Understanding 5. Thick fur, including between the pads of the feet is mostly due to genes. It keeps the animal warm in a harsh environment and helps it walk on slippery ice and snow. 6. Moving from place to place is mostly an environmentally-determined trait. It helps the animal by giving it a larger area to find food, which is scarce.

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