One Becomes Two

What is asexual reproduction?

An individual organism does not live forever. The survival of any species depends on the ability to reproduce. Reproduction lets genetic information be passed on to new organisms. Reproduction involves various kinds of cell division.

Most single-celled organisms and some multicellular organisms reproduce asexually. In **asexual reproduction** (ay•SEHK•shoo•uhl ree•pruh•DUHK•shuhn), one organism produces one or more new organisms that are identical to itself. These organisms live independently of the original organism. The organism that produces the new organism or organisms is called a *parent*. Each new organism is called an *offspring*. The parent passes on all of its genetic information to the offspring. So, the offspring produced by asexual reproduction are genetically identical to their parents. They may differ only if a genetic mutation happens.

ACTIVE READING

5 Relate Describe the genetic makeup of the offspring of asexual reproduction.

_____

_____

_____

Dandelions usually reproduce asexually. The dandelions in this field may all be genetically identical!

Think Outside the Book

6 Summarize Research five organisms that reproduce asexually. Make informative flash cards that describe how each organism reproduces asexually. When you have finished, trade flashcards with a classmate to learn about five more organisms.

How do organisms reproduce asexually?

Organisms reproduce asexually in many ways. In prokaryotes, which include bacteria and archaea, asexual reproduction happens by cell division. In eukaryotes, which include single-celled and multicellular organisms, asexual reproduction is a more involved process. It often involves a type of cell division called *mitosis* (my•TOH•sis). Mitosis produces genetically identical cells.

Binary Fission

Binary fission (BY•nuh•ree FISH•uhn) is the form of asexual reproduction in prokaryotes. It is a type of cell division. During binary fission, the parent organism splits in two, producing two new cells. Genetically, the new cells are exactly like the parent cell.

Budding

During *budding*, an organism develops tiny buds on its body. A bud grows until it forms a new full-sized organism that is genetically identical to the parent. Budding is the result of mitosis. Eukaryotes such as single-celled yeasts and multicellular hydras reproduce by budding.

Spores

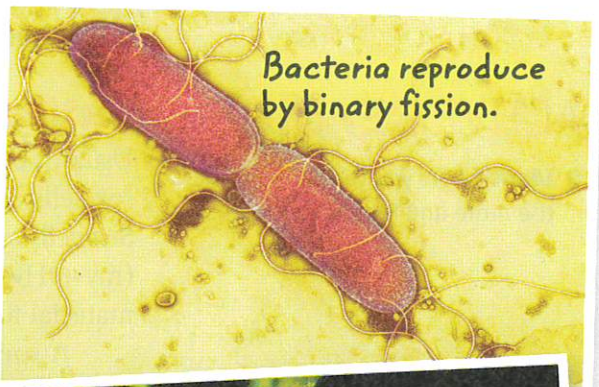
A *spore* is a specialized cell that can survive harsh conditions. Both prokaryotes and eukaryotes can form spores. Spores are produced asexually by one parent. Spores are light and can be carried by the wind. In the right conditions, a spore develops into an organism, such as a fungus.

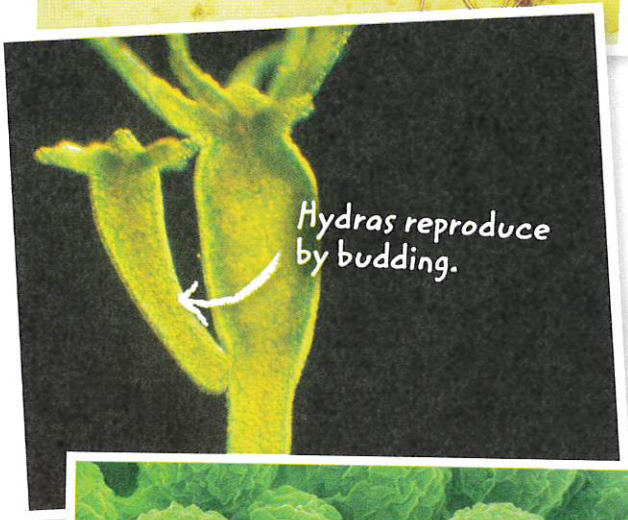
Vegetative Reproduction

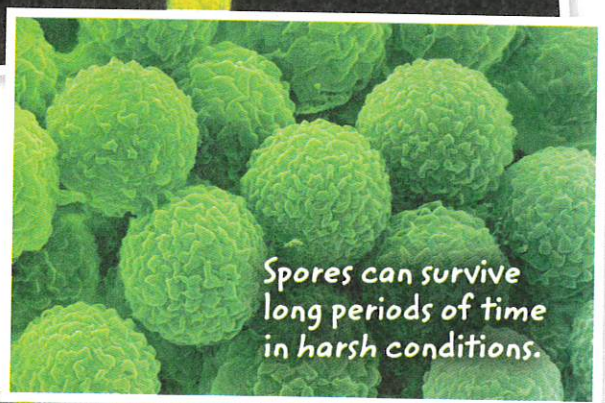
Some plants are able to reproduce asexually by *vegetative reproduction*. Mitosis makes vegetative reproduction possible. New plants may grow from stems, roots, or leaves. Runners are aboveground stems from which a new plant can grow. Tubers are underground stems from which new plants can grow. Plantlets are tiny plants that grow along the edges of a plant's leaves. They drop off the plant and grow on their own.

Visualize It!

7 Claims • Evidence • Reasoning Pick one of the pictures below. Make a claim about how the type of asexual reproduction shown can help the organism reproduce quickly. Summarize evidence to support your claim and explain your reasoning.







Two Make One

What is sexual reproduction?

Most multicellular organisms can reproduce sexually. In **sexual reproduction** (SEHK•shoo•uhl ree•pruh•DUHK•shuhn), two parents each contribute a sex cell to the new organism. Half the genes in the offspring come from each parent. So, the offspring are not identical to either parent. Instead, they have a combination of traits from each parent.

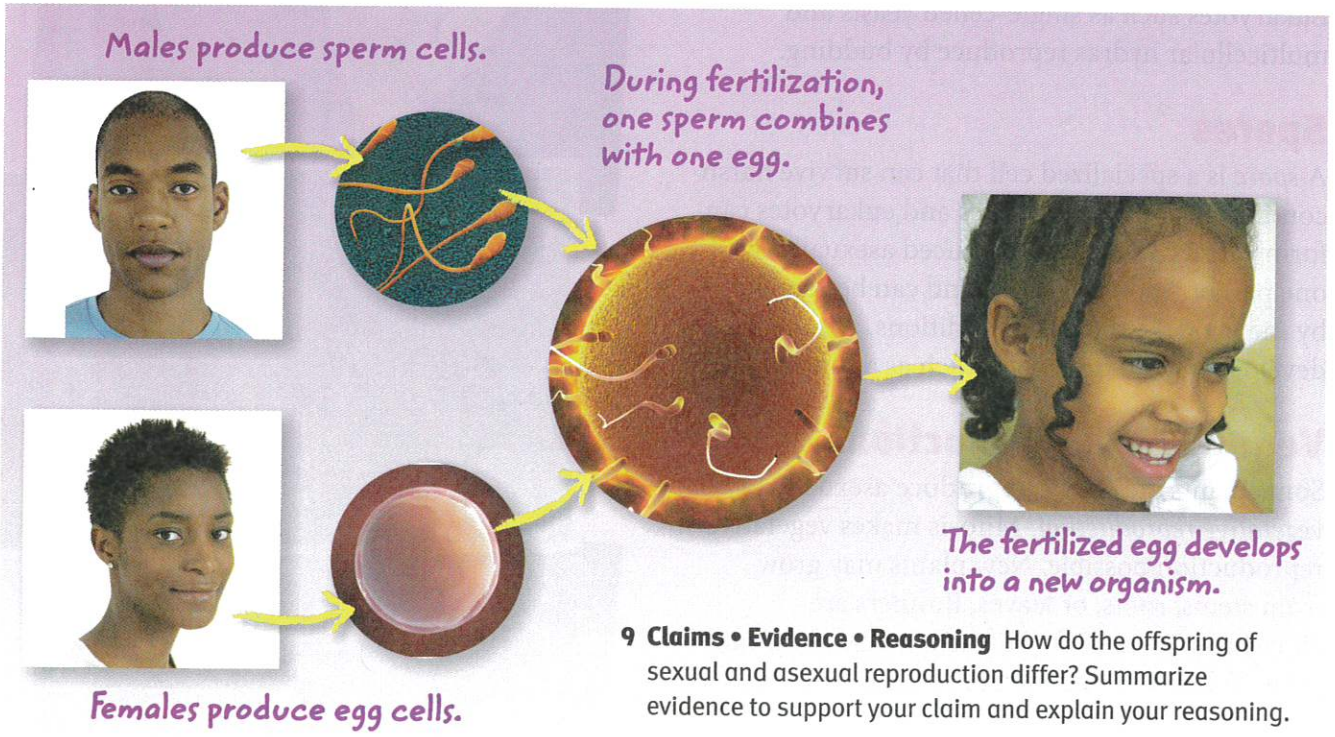
ACTIVE READING

8 Identify As you read, underline the male and female sex cells.

Fertilization

Usually, one parent is male and the other is female. Males produce sex cells called *sperm cells*. Females produce sex cells called *eggs*. Sex cells are produced by a type of cell division called *meiosis* (my•OH•sis). Sex cells have only half of the full set of genetic material found in body cells.

A sperm cell and an egg join together in a process called **fertilization** (fer•tl•i•ZAY•shuhn). When an egg is fertilized by a sperm cell, a new cell is formed. This cell is called a *zygote* (ZY•goht). It has a full set of genetic material. The zygote develops into a new organism. The zygote divides by mitosis, which increases the number of cells. This increase in cells produces growth. You are the size that you are today because of mitosis.



9 Claims • Evidence • Reasoning How do the offspring of sexual and asexual reproduction differ? Summarize evidence to support your claim and explain your reasoning.

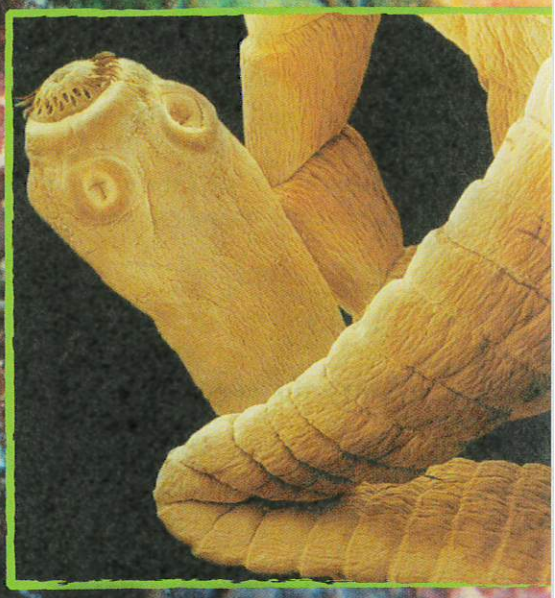
WHY IT **MATTERS**

Odd Reproduction

WEIRD SCIENCE

It may seem like only single-celled organisms undergo asexual reproduction. However, many multicellular organisms reproduce asexually.

Appearing Act
Some organisms, such as aphids, reproduce asexually by *parthenogenesis*. A female produces young without fertilization.



Falling to Pieces
Tapeworms can reproduce asexually by *fragmentation*. Each segment of the worm can become a new organism if it breaks off of the worm.

Seeing Stars
Organisms such as starfish reproduce asexually by *regeneration*. Even a small part of the starfish can grow into a new organism.

Extend

10 Identify Which types of asexual reproduction involve part of an organism breaking off?

11 Investigate Research the advantages and disadvantages of a type of reproduction shown on this page.

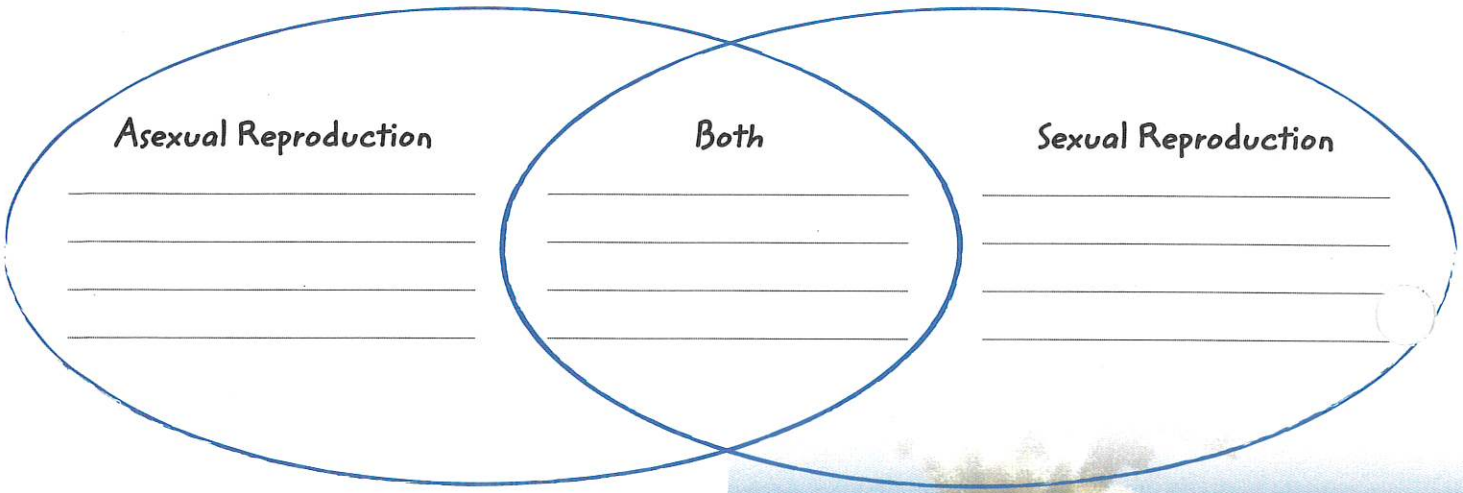
12 Claims • Evidence • Reasoning A female shark was left alone in an aquarium tank. She was not pregnant when placed in the tank. Later scientists were surprised to find a baby shark in the tank. Make a claim about what type of reproduction took place in this scenario. Summarize evidence to explain your reasoning.

Added Advantage

What are the advantages of each type of reproduction?

Organisms reproduce asexually, sexually, or both. Each type of reproduction has advantages. For example, sexual reproduction involves complex structures, such as flowers and other organs. These are not needed for asexual reproduction. But the offspring of sexual reproduction may be more likely to survive in certain situations. Read on to find out more about the advantages of each.

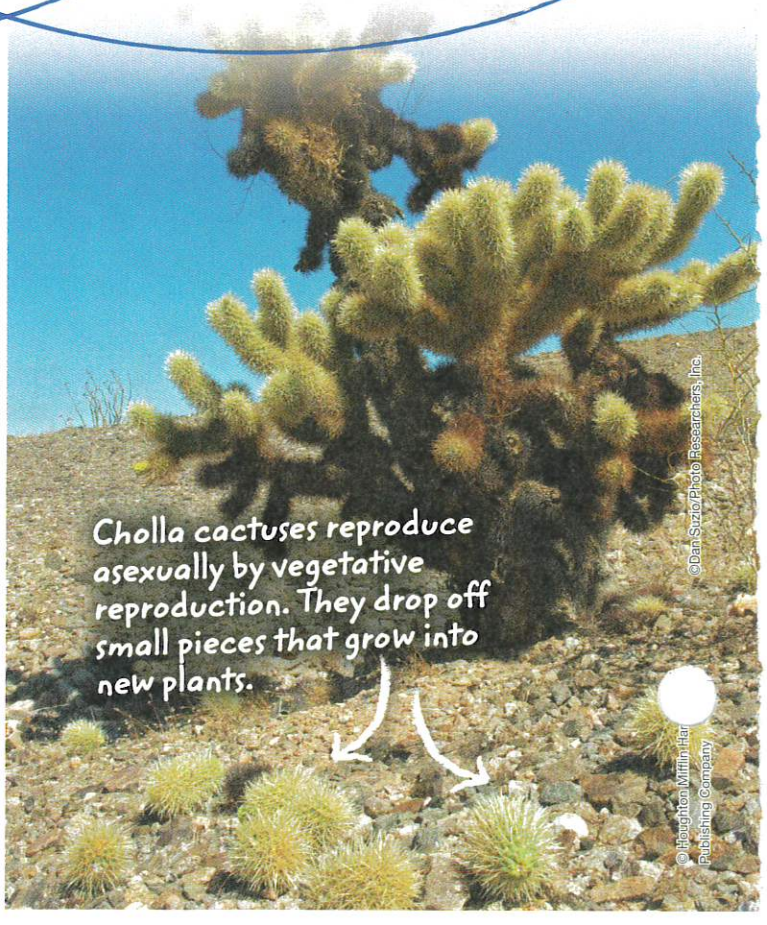
13 Compare Use the Venn diagram below to compare asexual and sexual reproduction.

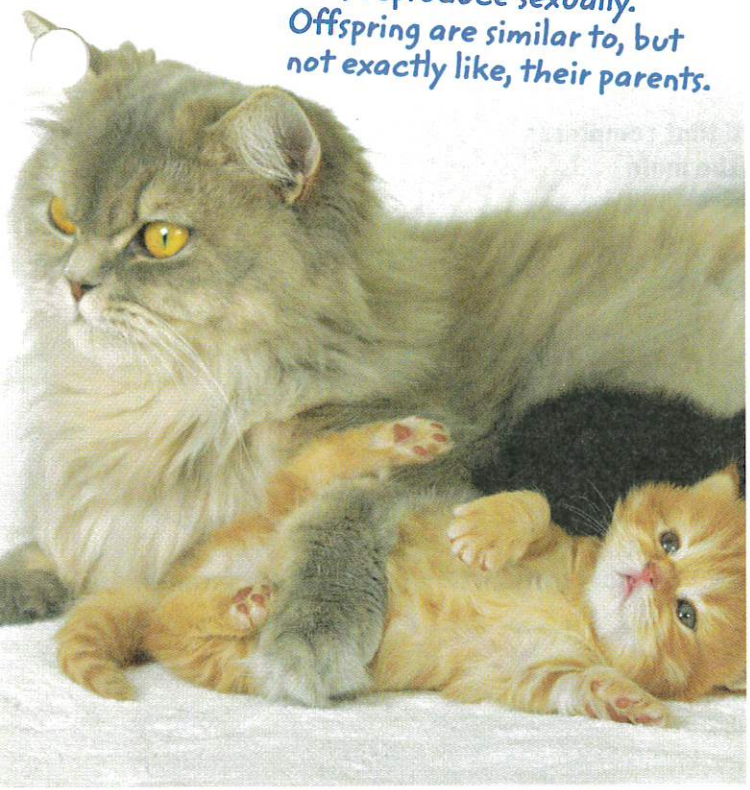


Advantages of Asexual Reproduction

Asexual reproduction has many advantages. First, an organism can reproduce very quickly. Offspring are identical to the parent. So, it also ensures that any favorable traits the parent has are passed on to offspring. Also, a parent organism does not need to find a partner to reproduce. Finally, all offspring—not just females—are able to produce more offspring.

14 List Identify four advantages of asexual reproduction.





Cats reproduce sexually. Offspring are similar to, but not exactly like, their parents.

Advantages of Sexual Reproduction

Sexual reproduction is not as quick as asexual reproduction. Nor does it produce as many offspring. However, it has advantages. First, it increases genetic variation. Offspring have different traits that improve the chance that at least some offspring will survive. This is especially true if the environment changes. Offspring are not genetically identical to the parents. So, they may have a trait that the parents do not have, making them more likely to survive.

15 Claims • Evidence • Reasoning Make a claim about how increased genetic variation can help some offspring survive. Cite evidence, and explain your reasoning.

Advantages of Using Both Types of Reproduction

Some organisms can use both types of reproduction. For example, when conditions are favorable, many plants and fungi will reproduce asexually. Doing so lets them spread quickly and take over an area. When the environment changes, these organisms will switch to sexual reproduction. This strategy increases the chance that the species will survive. Because of genetic variation, at least some of the offspring may have traits that help them make it through the environmental change.

16 Compare In the table below, place a check mark in the cells that describe a characteristic of asexual or sexual reproduction.

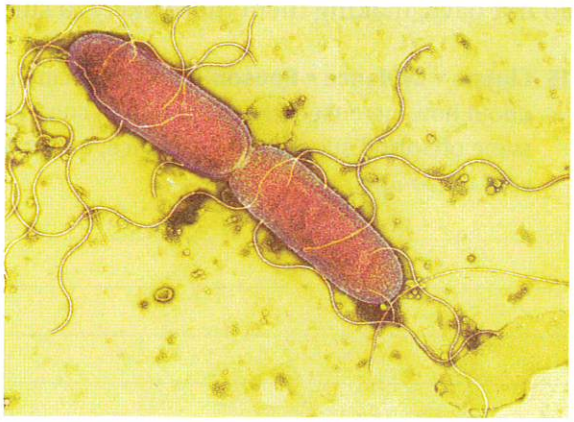
	Quick	Increases chance of survival in changing environments	Produces genetic variation	Doesn't need a partner	Requires complex structures
Asexual reproduction					
Sexual reproduction					

Visual Summary

To complete this summary, circle the correct word that completes each statement. You can use this page to review the main concepts of the lesson.

Reproduction

Asexual reproduction involves one parent.



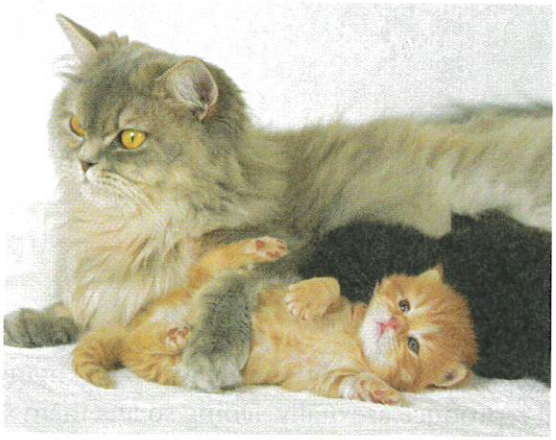
17 The offspring of asexual reproduction are genetically identical / similar to the parent organisms.

18 Prokaryotes reproduce by budding / binary fission.

19 Specialized reproductive structures called runners / spores can survive harsh conditions.

20 A benefit of asexual reproduction is that it is fast / slow.

Sexual reproduction involves two parents.



21 Male organisms produce sex cells called eggs / sperm cells.

22 Male and female sex cells join during fertilization / meiosis.

23 Sexual reproduction increases genetic variation / similarity.

24 Claims • Evidence • Reasoning How can both asexual reproduction and sexual reproduction allow for the survival of a species? Summarize evidence to support your claim and explain your reasoning.

Lesson Review

LESSON 3

Vocabulary

Fill in the blanks with the term that best completes the following sentences.

1 After _____, the zygote develops into a larger organism.

2 An advantage of _____ reproduction is the ability to reproduce quickly.

3 The offspring of _____ reproduction are more likely to survive changes in the environment.

Key Concepts

4 **Identify** What are some advantages of asexual and sexual reproduction?

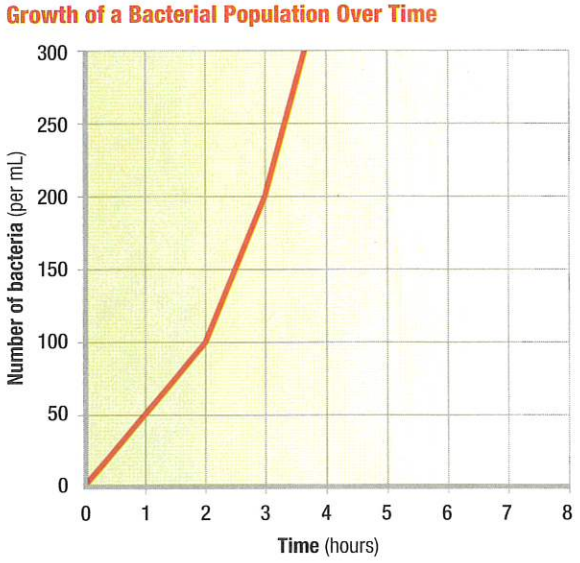
5 **Compare** In sexual reproduction, how do the offspring compare to the parents?

6 **Identify** List four types of asexual reproduction.

7 **Explain** Why do some organisms use both types of reproduction?

Critical Thinking

Use the graph to answer the following questions.



8 **Infer** What type of reproduction is most likely taking place? Explain your reasoning.

9 **Claims • Evidence • Reasoning** Which advantage of reproduction does the graph show? Summarize evidence to support your claim, and explain your reasoning.

10 **Claims • Evidence • Reasoning** Make a claim about how the graph might change if the environmental conditions of the bacteria were to suddenly change. Summarize evidence to support your claim, and explain your reasoning.