Name _____ Date _____ Class _____

Viruses

Guide for Reading

- How do viruses differ from living things?
- What is the basic structure of a virus?
- How do viruses multiply?

A **virus** is a tiny, nonliving particle that enters and then reproduces inside a living cell. Biologists consider viruses to be nonliving because viruses are not cells. Viruses do not use energy to grow or to respond to their surroundings.

Although viruses can multiply, they do so differently than organisms. Viruses can only multiply when they are inside a living cell. The organism that a virus enters and multiplies inside is called a host. A **host** is an organism that provides a source of energy for a virus or another organism. Organisms that live on or in a host and cause harm to the host are called **parasites.** Most viruses are like parasites because they destroy the cells in which they multiply.

Viruses vary in shape and size. Viruses can be round, or rod-shaped, or shaped like bricks, threads, or bullets. Some viruses, including bacteriophages, have complex, robot like shapes. A **bacteriophage** is a virus that infects bacteria. Viruses are much smaller than cells.

Scientists may name a virus after the disease it causes, the organisms they infect, the place where it was first found, or the scientists who first identified it.

All viruses have two basic parts: a protein coat that protects the virus and an inner core made of genetic material. Some viruses are surrounded by an additional membrane envelope. Each virus contains unique proteins on its outer surface. The shape of these proteins allows the virus to attach to, or lock onto, only certain host cells.

After a virus attaches to a host cell, it enters the cell. **Once inside a cell, a virus's genetic material takes over many of the cell's functions. It instructs the cell to produce the virus's proteins and genetic material. These proteins and genetic material then assemble into new viruses.**

An active virus immediately takes over the cell's functions, and the cell quickly begins to produce the virus's proteins and genetic material. These parts are assembled into new viruses. When it is full of new viruses, the host cell bursts open and releases the new viruses.

When a hidden virus enters a host cell, the virus's genetic material becomes part of the cell's genetic material. The virus's genetic material may stay inactive for a long time. Then, the virus's genetic material suddenly becomes active and takes over the cell's functions and replicates. Once the host cell is full of new viruses, it bursts open to release them.

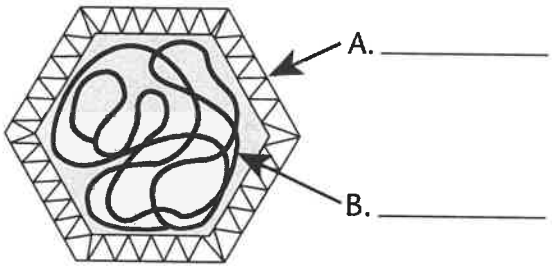
Name _____ Date _____ Class _____

Viruses

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Viruses are considered to be nonliving. How are viruses similar to living organisms? How are they different?
2. How are viruses similar to parasites?
3. How do hidden viruses differ from active viruses?
4. In the diagram below, identify the two structural parts of the virus. Explain the function of each part.



Building Vocabulary

Write a definition for each of the following terms on the lines below.

5. virus

6. bacteriophage

7. parasite

8. host

Name _____ Date _____ Class _____

Bacteria

Guide for Reading

- How do the cells of bacteria differ from those of eukaryotes?
- What do bacteria need to survive?
- Under what conditions do bacteria thrive and reproduce?
- What positive roles do bacteria play in people's lives?

Bacteria are single-celled organisms. **Bacteria are prokaryotes. The genetic material in their cells is not contained in a nucleus.** Bacterial cells have one of three basic shapes: spherical, rodlike, or spiral.

Most bacterial cells are surrounded by a rigid cell wall that helps to protect the cell. Inside the cell wall is the cell membrane that controls what materials pass into and out of the cell. **Cytoplasm** is the gel-like material inside the cell membrane. Inside the cytoplasm are tiny structures called **ribosomes** that are the chemical factories where proteins are produced. The cell's genetic material is also located in the cytoplasm, and contains the instructions for all the cell's functions. Some bacteria have flagella. A **flagellum** is a long, whiplike structure that extends from the cell membrane and out through the cell wall. A flagellum helps a cell to move.

All bacteria need certain things to survive. **Bacteria must have a source of food and a way of breaking down the food to release its energy.** Some bacteria are autotrophs and make their own food. Others are heterotrophs that obtain food by consuming autotrophs or other heterotrophs. The process of breaking down food to release its energy is called **respiration.**

When bacteria have plenty of food, the right temperature, and other suitable conditions, they thrive and reproduce frequently. Bacteria reproduce by **binary fission,** a process in which one cell divides to form two identical cells. Binary fission is a form of asexual reproduction. **Asexual reproduction** is a reproductive process that involves only one parent and produces offspring that are identical to the parent. Some bacteria perform a simple form of sexual reproduction called conjugation. **Sexual reproduction** involves two parents who combine their genetic material to produce a new organism that differs from both parents. During **conjugation,** one bacterium transfers some of its genetic material into another. After the transfer the cells separate.

Many bacteria can survive harsh conditions by forming endospores. An **endospore** is a small, rounded, thick-walled, resting cell that forms inside a bacterial cell.

Some bacteria cause diseases and other harmful conditions. However, most bacteria are either harmless or helpful to people. **Bacteria are involved in oxygen and food production, environmental recycling and cleanup, and health maintainance and medicine production.** Helpful bacteria produce foods such as cheese and pickles. However, some bacteria cause food to spoil. One method to slow down food spoilage is **pasteurization,** where food is heated to a temperature that is high enough to kill most harmful bacteria without changing the taste of the food. Heterotrophic bacteria in the soil break down materials for reuse. These bacteria are **decomposers**—organisms that break down large chemicals in dead organisms into small chemicals.

Name _____ Date _____ Class _____

Bacteria

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. How are bacterial cells different from the cells of eukaryotes?
2. List four ways that bacteria are helpful to people.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

____ 3. cytoplasm
____ 4. endospore
____ 5. binary fission
____ 6. decomposer
____ 7. sexual reproduction
____ 8. flagellum
____ 9. asexual reproduction
____ 10. conjugation
____ 11. respiration
____ 12. ribosome

a. where two parents combine their genetic material to produce a new organism that differs from both parents
b. where one bacterium divides to form two identical bacteria cells
c. a small, thick-walled resting cell that forms inside a bacterial cell
d. the region inside the cell membrane
e. organism that breaks down the large chemicals in dead organisms into small chemicals
f. where one bacterium transfers genetic material into another bacterial cell
g. the cell's chemical factories where proteins are produced
h. the process of breaking down food to release energy
i. whiplike structure that helps a cell to move
j. where one parent reproduces offspring identical to that parent

Name _____ Date _____ Class _____

Fungi

Guide for Reading

- What characteristics do fungi share?
- How do fungi reproduce?
- What roles do fungi play in nature?

Most **fungi** share several important characteristics: **Fungi are eukaryotes that have cell walls, are heterotrophs that feed by absorbing their food, and use spores to reproduce.** Fungi also need moist, warm places in which to grow. They vary in size from unicellular yeasts to multicellular mushrooms. Three major groups of fungi include sac fungi, club fungi, and zygote fungi.

Hyphae (singular hypha) are branching, threadlike tubes that make up the bodies of multicellular fungi. What a fungus looks like depends on the arrangement of its hyphae.

Fungi are heterotrophs, but they do not take food into their bodies like animals do. First, the fungus grows hyphae into a food source. Then digestive chemicals ooze from the hyphae into the food. The digestive chemicals break down the food into small substances that can be absorbed by the hyphae. Some fungi feed on the remains of dead organisms. Others are parasites that break down the chemicals in living organisms.

Fungi usually reproduce by making spores. The lightweight spores are surrounded by a protective covering and can be carried easily through the air or water to new sites. Fungi produce spores in reproductive structures called **fruiting bodies.** Unicellular yeasts use a form of asexual reproduction called **budding.** In budding, a small cell grows from the body of a large, well-fed cell. Asexual reproduction results in fungi that are genetically identical to the parent. Fungi may reproduce sexually, especially when conditions become less favorable. This occurs when the hyphae of two fungi grow together and new genetic material is exchanged. Its spores develop into fungi genetically different from either parent.

Fungi play important roles as decomposers and recyclers on Earth. Many fungi provide foods for people. Some fungi cause disease while others fight disease. Still other fungi live in symbiosis with other organisms. Fungi break down the chemicals in dead organisms. This returns nutrients to the soil. Yeasts are important in the preparation of foods such as bread. People also eat some types of fungi, such as mushrooms. Many fungi cause disease in crops and in humans. Others, such as *Penicillium*, make useful substances that kill bacteria. The hyphae of some fungi grow among the roots of plants. The hyphae help the plant absorb more water and nutrients from the soil. In return, the fungus feeds on extra food the plant makes. A **lichen** consists of a fungus living in a mutualistic relationship with either algae or autotrophic bacteria.

Name _____ Date _____ Class _____

Fungi

Understanding the Main Ideas

Figures 1 and 2 show two possible life cycles of fungi. Use these figures to answer questions 1–5. Write the answers on a separate sheet of paper.

Figure 1

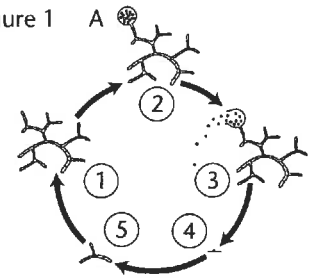
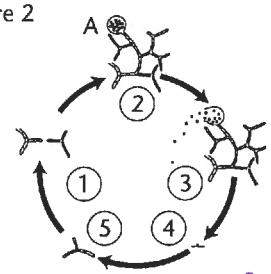


Figure 2



1. What is structure A in Figure 1 called? Describe two ways fungi can reproduce!
2. Step 5 in Figure 1 shows a new fungus. Is it identical to its parent?
3. Step 5 in Figure 2 also shows a new fungus. Is it identical to its parents?
4. What kind of reproduction does Figure 1 show?
5. What kind of reproduction does Figure 2 show?

Answer the following questions on a separate sheet of paper.

6. Does a fungus get its food the same way you do? Explain.
7. Describe what would happen if fungi did not exist.

Building Vocabulary

Fill in the space to complete each sentence.

8. A(n) _____ consists of the mutualistic relationship of a fungus and either algae or autotrophic bacteria.
9. A(n) _____ is one of the branching, threadlike tubes that make up the bodies of multicellular fungi.
10. _____ is a form of asexual reproduction in yeast that does not require the production of spores.
11. A(n) _____ is a structure that produces the spores of a fungus.
12. _____ are eukaryotes that have cell walls and are heterotrophs.

Name _____ Date _____ Class _____

Viruses and Bacteria ▫ Section Summary

Viruses, Bacteria, and Your Health

Guide for Reading

- How do infectious diseases spread?
- What treatments are effective for bacterial and viral diseases?
- How can you protect yourself against infectious diseases?

Many diseases are infectious diseases—illnesses that pass from one organism to another. Infectious diseases can spread through contact with either an infected person, a contaminated object, an infected animal, or an environmental source. Other infectious diseases can be spread by inhaling the tiny drops of moisture that an infected person sneezes or coughs into the air. This is because the drops of moisture contain organisms that cause the disease.

Some viruses and bacteria can survive outside a person's body. They can then be spread by objects or in contaminated food or water. If you touch an object that an infected person has sneezed or coughed on, you may transfer some viruses or bacteria to yourself when you touch your mouth or eyes. If you drink water or eat food that an infected person has contaminated, you may get sick.

Animal bites can transmit some serious infectious diseases to humans. Rabies can be spread through the bite of an infected animal. Bites from ticks can spread the bacteria that cause Lyme disease. Bites from mosquitoes can spread the virus that causes encephalitis.

Some viruses and bacteria live in food, water, and soil, or on the surface of objects. The places where they are naturally found are environmental sources of disease. A soil bacterium called Clostridium tetani, a soil-dwelling bacterium, can enter a person's body through a wound. It produces a poison known as a toxin, which can cause the deadly disease tetanus.

Fortunately, many bacterial diseases can be cured with medications known as antibiotics. An antibiotic is a chemical that can kill bacteria without harming a person's cells. Antibiotics are less effective today than they once were because many bacteria have become resistant to antibiotics. Antibiotic resistance results when some bacteria are able to survive in the presence of an antibiotic. Unlike bacterial diseases, there are currently no medications that can cure viral infections. For most infectious diseases, however, the best treatment is bed rest. However, there are many over-the-counter medications that treat the disease's symptoms.

One way to prevent the spread of infectious diseases is vaccines. Vaccines are important tools that help prevent the spread of infectious diseases. A vaccine is a substance introduced into the body to stimulate the production of chemicals that destroy specific viruses or bacteria. It may be made from dead or altered viruses or bacteria. The altered viruses or bacteria put the body "on alert." If the virus or bacterium ever enters the body, it is destroyed before it can produce disease.

The best way to protect against infectious diseases is to stay healthy. You should eat nutritious food and get plenty of rest, fluids, and exercise.

Name _____ Date _____ Class _____

Viruses, Bacteria, and Your Health

Understanding Main Ideas

Complete the table below by naming examples of behaviors to avoid, and behaviors to practice in order to prevent the spread of infectious diseases.

What Can You Do to Prevent Catching an Infectious Disease?		
How Disease Is Spread	DO NOT	DO
Contact with Infected Person		
Contact with Infected Object		
Contact with Infected Animal		
Environmental Source		

Answer the following questions on a separate sheet of paper.

1. Why is it important to know whether your sore throat is caused by a virus or bacteria?
2. How do antibiotics work, and why are they becoming less effective?
3. How can a vaccine help prevent an infectious disease?

Building Vocabulary

From the list below, choose the term that best completes each sentence.

infectious diseases vaccine antibiotic
antibiotic resistance toxin

4. Dead or altered viruses or bacteria that are used to stimulate the body to be "on alert" are called a(n) _____.
5. Illnesses that pass from one organism to another are called _____.
6. Chemicals made by microorganisms that are used to kill bacteria are called a(n) _____.
7. A poisonous substance produced by bacteria is called a(n) _____.
8. _____ results when some bacteria are able to survive in the presence of an antibiotic.

Name _____ Date _____ Class _____

Preventing Infectious Disease

Key Concepts

- How does the body acquire active immunity?
- How does passive immunity occur?

Immunity is the body's ability to destroy pathogens before they can cause disease. The two basic types of immunity are active and passive.

If you've been sick with the chicken pox, you have active immunity to the chicken pox virus. In **active immunity,** your body has produced the antibodies that fight the pathogens. **A person acquires active immunity when his or her own immune system produces antibodies in response to the presence of a pathogen.**

Active immunity is produced when the T cells and B cells of a person's immune system help destroy the disease-causing pathogens. After the person recovers, some of the T cells and B cells keep the "memory" of the pathogen's antigen. If that pathogen enters the body again, the memory cells recognize the pathogen's antigen. The memory cells start the immune response so quickly that the person usually doesn't get sick. Active immunity often lasts for many years, and sometimes it lasts for life.

A second way to gain active immunity is by being vaccinated against a disease. **Vaccination,** or immunization, is the process by which harmless antigens are deliberately introduced into a person's body to produce active immunity. The substance used in a vaccination is called a **vaccine.** A vaccine usually consists of pathogens that have been weakened or killed.

If you do come down with a disease that is caused by a bacteria, you may be given an **antibiotic.** An antibiotic is a chemical that kills or slows the growth of bacteria without harming body cells. There are no medications that cure viral illnesses. However, there are some over-the-counter medications that may help you feel more comfortable while you get better.

When people are infected by some pathogens, the people are sometimes given injections that contain antibodies to the pathogen's antigens. This type of protection is called passive immunity. **Passive immunity** results when antibodies are given to a person—the person's immune system does not make them. **A person acquires passive immunity when the antibodies that fight the pathogen come from a source other than the person's body.** Passive immunity usually lasts no more than a few months.

A baby acquires passive immunity to some diseases before birth. Antibodies from the mother's body pass into the baby's body.

Name _____ Date _____ Class _____

Preventing Infectious Disease

Understanding Main Ideas

Complete the table below by stating whether each characteristic applies to passive or active immunity.

Characteristic	Type of Immunity
Lasts only a few months	1.
Can last for a lifetime	2.
May be gained by coming down with a disease	3.
Passes from a pregnant mother to her unborn child	4.
Can be acquired through vaccination	5.

Answer the following on a separate sheet of paper.

6. Explore two ways in which active immunity is produced.
7. Explain why you might treat a bacterial infection but not a viral disease with an antibiotic.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition from the right column on the line beside the term in the left column.

____ 8. active immunity

____ 9. antibiotic

____ 10. passive immunity

____ 11. vaccination

____ 12. vaccine

a. the immunity gained when a person's own immune system produces antibodies in response to a pathogen

b. a substance consisting of pathogens that have been weakened or killed

c. a chemical that kills or slows the growth of bacteria

d. the deliberate introduction of harmless pathogens into a person's body to produce active immunity

e. the temporary immunity gained from introducing antibodies from another source into a person's own body