

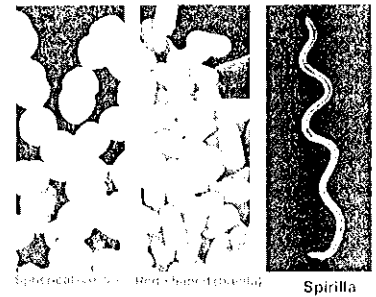
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Name _____

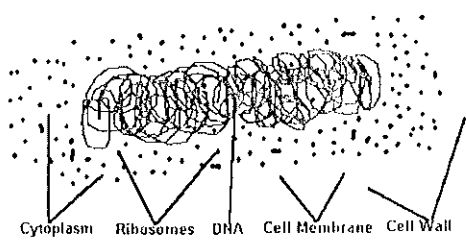
Bacteria

Read, annotate, and answer all questions.

Bacteria are single-celled, **prokaryotic** organisms. They are considered living organisms because they have the characteristics of living things – made of cells, have levels of organization, grow and develop, reproduce, use energy, and respond to their environment. Bacterial cells have one of three basic shapes: **spirilla** or spiral-shaped, **bacilli** or rod-like; and **cocci**, or spherical. Most bacterial cells are surrounded by a rigid cell wall that helps to protect the cell. Inside the cell wall is the cell membrane. Bacteria also have cytoplasm, the gel-like material



A Typical Prokaryote Cell



that contains ribosomes that are the chemical factories where proteins are produced. Some bacteria have **flagella** to help move. Others twist and spin or have to be carried from place to place by the *air, water currents, objects, or other methods*. Some bacteria are able to survive in extreme conditions that kill most other life. These are called **extremophiles**. The ones that can live in extremely hot environments are called **thermophiles**.

Those that live in very salty environments are called **halophiles**. There are also gas-producing bacteria called **methanogens** who live in the stomach of cows and aid in digestion.

1. Bacteria are _____ which means their genetic material is not contained in a nucleus.

2. Bacteria are alive. Name 6 characteristics of living organisms?

_____	_____	_____
_____	_____	_____

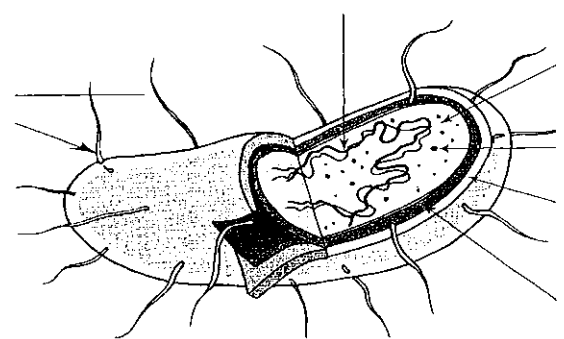
3. What are the three basic shapes of bacteria?

a. _____ b. _____ c. _____

4. What structure do some bacterium use to move around? _____

5. If bacteria do not have the above structure, how else do they get around _____

6. Label the bacterium cell with these words: cell wall, cell membrane, Ribosomes, DNA, cytoplasm, and ribosomes.



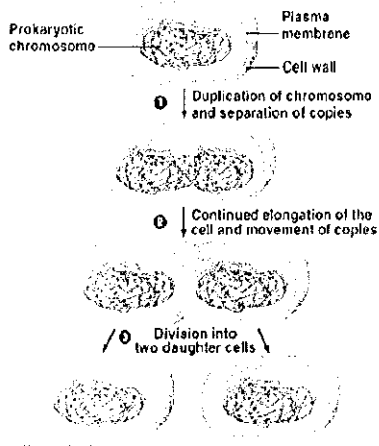
7. Name three kinds of extremophiles bacteria. _____, _____, and _____.

Bacteria must have a source of food and a way of breaking down the food to release its energy. Some bacteria are **autotrophs**. They make complex organic molecules (carbohydrates, fats, and proteins) from simple substances in their environment. They do this either using the energy from light (**photosynthesis**) or chemical reactions (**chemosynthesis**). Other bacteria are **heterotrophs** getting their food from eating other organisms. Some bacteria break down dead or decaying organisms. They are called **decomposers**. This is how bacteria help to clean up and recycle matter through the environment allowing new organisms to be able to grow.

8. True or False? All bacteria are heterotrophs.

9. _____ is the process of making food with chemicals and energy from hot water coming from vents on the ocean floor.

10. Bacteria that clean up and recycle the environment by eating dead organisms are called _____.



When bacteria have plenty of food, the right temperature, and other suitable conditions, they thrive and reproduce frequently. Bacteria reproduce **asexually by binary fission**, a process in which one cell divides to form two identical cells that involves only *one parent* and produces offspring that are identical to the parent. They can reproduce rapidly. Just two bacteria can become 562,929,940,000,000 in a 24 hour period. If this is a **pathogenic bacteria (disease causing)**, it can easily lead to an **epidemic**- or widely spread. A world wide epidemic is called a **pandemic**. Some bacteria perform a simple form of sexual reproduction called **conjugation** that 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.



11. Bacteria reproduce asexually in a process called _____.

12. Binary fission can occur very rapidly where 2 bacterium can become _____ in 24 hours.

13. Due to rapidly harmful bacteria reproduce and caused disease, they can cause an _____ where disease is widespread in an area.

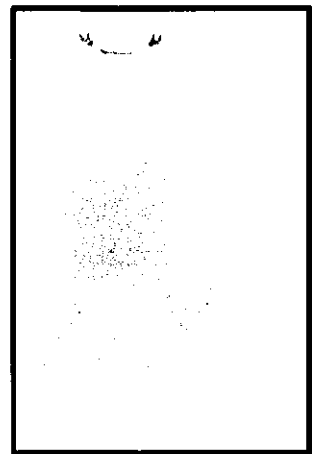
14. When a disease spreads around the world, it is called a _____.



Many bacteria can survive harsh conditions, such as water shortage, temperature change, etc. by forming **endospores**. An endospore is a small, rounded, thick-walled, **resting** cell that forms inside a bacterial cell. They can live like this for years and then when the right conditions occur, they begin to grow and multiply.

15. When do bacteria form endospores? _____

Eubacteria are everywhere, on your skin, in the air, in your body, etc. 560,000 bacterium can fit on a pinhead! It's a good thing that most bacteria are either harmless or helpful to people. Bacteria are involved in oxygen and food production, environmental recycling and cleanup, and health maintenance and medicine production. Diabetics benefit from insulin-making bacteria, which is grown in vats, purified and made into medicine. Some bacteria are used to eat up gasoline and oil spills. Other bacteria make the nitrogen in the air useable for plants in the soil who then pass it on to consumers. Your intestines are hosts to good bacteria that help you digest food and keep harmful bacteria from sticking to them. These bacteria actually help to make vitamins your body needs. Helpful bacteria produce foods such as cheese, yogurt, and pickles.



17. Circle the letter of each sentence that is true about bacteria.
- a. All bacteria are harmful and can cause disease.
 - b. Some bacteria are autotrophic.
 - c. Bacteria help produce foods such as cheese, yogurt, and pickles.
 - d. Bacteria cannot live in our bodies.

18. Bacteria take _____ from the air and make it useable for plants in the soil.

19; True or False? Bacteria are used to clean up oil spills.

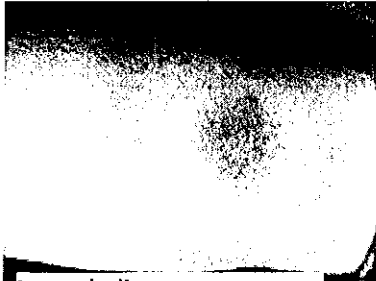
20. List 4 ways bacteria help your body.

However, some bacteria are not friendly but harmful. They can cause food to spoil. One method of slowing 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. Canning and dehydration are also ways to keep bacteria from spoiling food. And from causing diseases, like botulism, to those who eat the food. Botulism causes severe vomiting and diarrhea. In severe cases, it can be fatal.



21. What are some ways to slow down food from spoiling by bacteria?



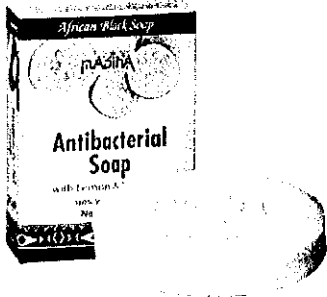
Lymes's disease

When eubacteria are harmful and cause diseases, they are considered pathogen-(produce suffering). They can infect all living organisms. In humans some of these diseases are strep throat, tuberculosis, staph infections, tonsillitis, plague, Lyme's disease, and even tooth decay, which can lead to heart disease, to name a few. Bacteria can live inside another organism and harm the host or host cell they live in. Any organism that does this is called a parasite.

22. What does pathogen mean? _____

23. List some of the disease caused by pathogenic bacteria. _____

24. What is an organism that lives off another organism, often times harming it, called? _____



Fortunately, antibiotics, like penicillin, were discovered, that can kill these pathogens. Antibiotic soaps and cleaners are also used to kill bacteria. However, overuse of antibiotics are creating yet another problem. Antibiotic resistance is when some bacteria do not die and develop a **resistance** to the antibiotic drug or cleaner and then reproduce to make a "super" bacteria requiring even stronger drugs and chemicals.

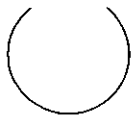
Some of the ways bacteria can enter the body through the mouth, nose, eyes, open wounds, contaminated food, and insect bites. It is very important to remember to always wash your hands. Just use plain soap and water. We don't need any "super bugs."

25. What can be taken to kill bacteria? _____

26. Why is there a concern about using too many antibiotics or antibacterial cleaners? _____

27. What are some ways bacteria can enter your body? _____

28. What is meant by the term "super bugs"? _____



Name: _____

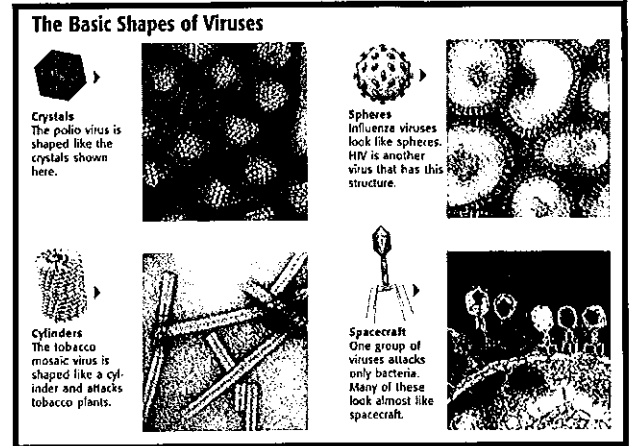
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Viruses

Read, annotate, and answer all the questions completely.

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. They cannot reproduce on their own.

Viruses can only multiply when they are inside a living cell. They can attack all organisms. 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.

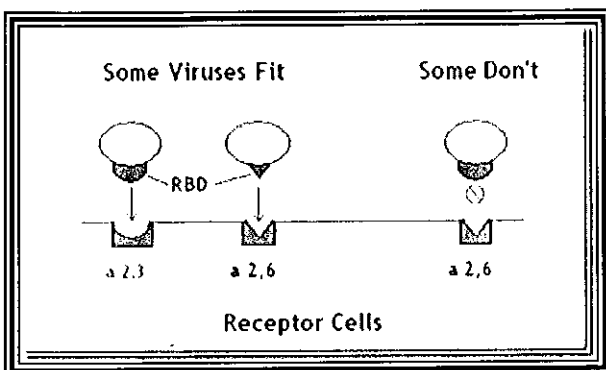


1. Why do biologists consider viruses to be nonliving? (Give a complete answer.)

2. True or false? Viruses multiply the same way as other organisms.

3. Circle the name of a living thing that provides energy for a virus or an organism.
a. parasite b. host c. bacteriophage d. particle

4. Viruses act like _____ 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. (See picture on top of page.) The shape of the virus determines what cells it can attack because the virus needs to fit on the cell just right. Some viruses,

including the bacteriophage, have complex, robot like shapes. (A *bacteriophage* is a virus that infects bacteria.) But viruses can attack **any** living organism, such as plants, animals, bacteria, and computers. No, wait, computers aren't living! ☺

Viruses are much smaller than cells. They are smaller than bacteria. They are measured in nanometers, which is one billionth of a meter. Scientists may name a virus after the disease it causes, the organisms they infect, the scientists who first identified it, or the place where it was first found, i.e. the West Nile virus.

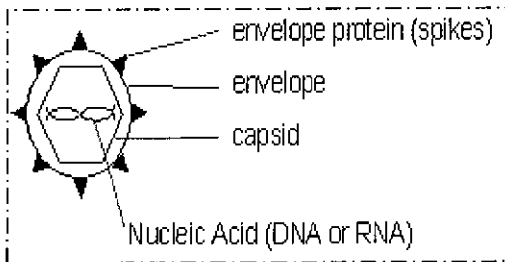
5. What shapes do viruses come in?

6. What organisms can viruses infect?

7. A virus that infects bacteria is called a(n) _____

8. True or false? Viruses are larger than bacteria.

9. How are viruses named?



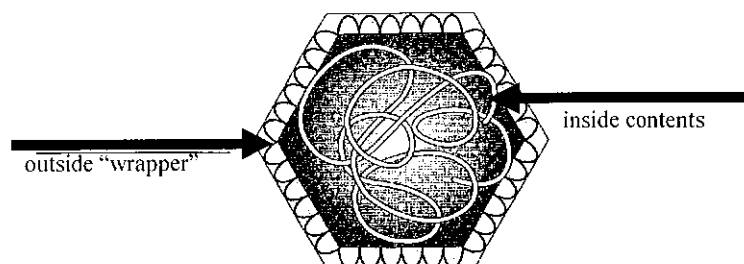
All viruses have two basic parts: a **protein coat** called a **capsid** that protects the virus and an **inner core made of genetic material**. Some viruses are surrounded by an additional membrane envelope. Each virus contains unique proteins on its outer surface.

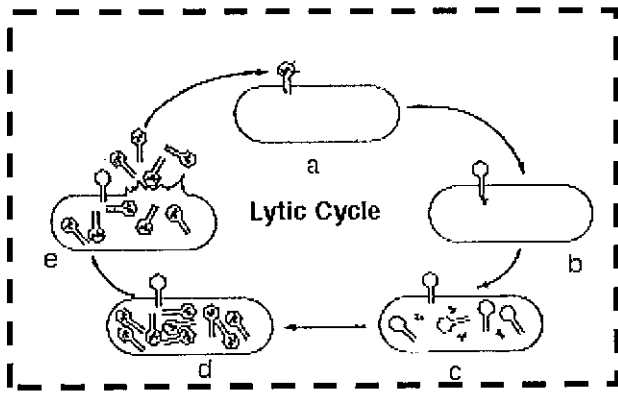
The capsid protects the virus and allows it to attach to, or lock onto, **only certain host cells**.

10. What is the purpose of the capsids? _____

11. True or False? Any virus can attach itself to any living cell.

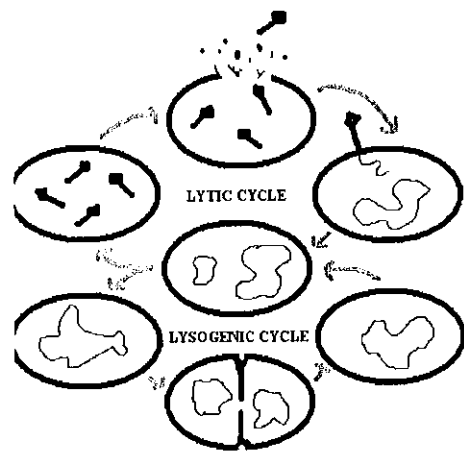
12. Label the two basic parts of a virus in this diagram





After a virus attaches to a host cell, it sends its genetic materials into it. An **active virus** immediately takes over the cell's functions. It instructs the cell to copy its DNA and produce the virus's proteins and genetic material. These proteins and genetic material then assemble into new viruses in what is called the **lytic cycle**. The lytic cycle consists

of the following steps: a. Attachment-the virus attaches to the cell; b. Injection-it injects its genetic material; c. Production-the cell then reproduces the virus' material; d. Assembly-the parts assemble to make new viruses, and lastly, when the cell is full of new viruses, e. Release-the host cell bursts (lyses) open and releases the new viruses.



When a **hidden virus** enters a host cell, the virus's genetic material actually becomes part of the cell's genetic material. Each time the cell reproduces itself, the virus parts are reproduced also. The virus's genetic material may stay **inactive** for a long time in the **lysogenic cycle**. Then for some unknown reason it can start to assemble, just like in the lytic cycle, make new viruses until the host cell bursts open and releases them. You

see this with cold sores, caused by a hidden herpes virus, that reoccur.

Match the kind of virus with the way it multiplies in a cell. Viruses may be used more than once

- | | |
|--|-----------------|
| ___ 13. the lytic cycle | a. hidden virus |
| ___ 14. the lysogenic cycle | b. active virus |
| ___ 15. The virus stays inactive for a long time. | |
| ___ 16. The virus immediately begins to multiply after entering the cell. | |
| ___ 17. The virus's genetic material becomes part of the cell's genetic material | |

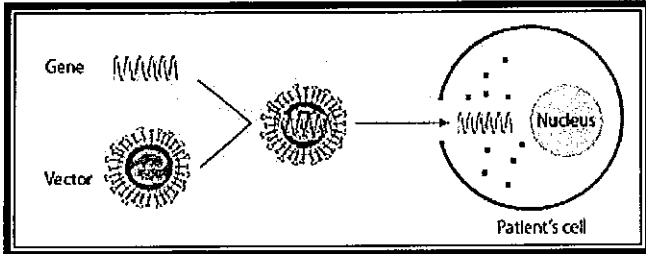
18. List the 5 steps of the lytic cycle.

- a. _____ b. _____ c. _____
- d. _____ e. _____



Rabies is an example of a virus that affects animals. Trees can also be affected by viruses. Some of the diseases in humans caused by viruses are ebola virus, AIDS, chickenpox, polio, and smallpox. Vaccines are a way to limit the effects of some of the diseases caused by viruses since they cannot be destroyed with antibiotics. **Vaccines** contain some of the virus in a weakened form so that the body can develop antibodies to

fight the disease should the person ever come in to full contact with it. Scientists have developed **antiviral drugs** as well. However, unlike antibiotics, they do not kill viruses; instead they inhibit their development by making it hard for them to attach to a cell or by preventing them from injecting their genetic material.



Scientists are learning how to take advantage of viruses' ability to inject cells. If the DNA in a cell has been damaged, it is injected with a virus with good DNA and then

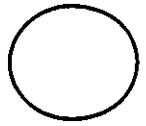
sent to the sick cell. Scientist are hoping that experimenting with gene therapy will cure many diseases including cancer.

19. List some diseases humans caused by viruses? _____

20. Name a virus that affects animals. _____
21. What is a vaccine? _____
22. What is the purpose of getting a vaccine? _____

23. True or False? Antiviral drugs kill viruses that make us sick.
24. Scientists are using the virus's ability to enter into a cell in _____ to inject good DNA to replace damaged DNA.

Name _____



Viruses

1. Why do biologists consider viruses to be nonliving?

2. True or false? Viruses multiply the same way as other organisms.

3. Circle the name of a living thing that provides energy for a virus or an organism.

- a. parasite b. host c. bacteriophage d. particle

4. Viruses act like _____ because they destroy the cells in which they multiply.

5. What organisms can viruses infect?

6. True or false? Each virus can enter only a few types of cells in a few specific species.

7. True or false? All viruses have the same shape.

8. A virus that infects bacteria is called a(n) _____

9. True or false? Viruses are much smaller than bacteria.

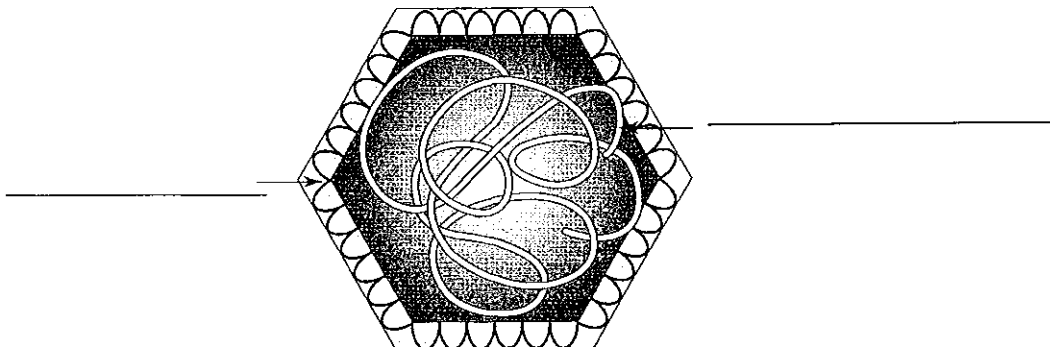
10. Because viruses are so small, they are measured in units called _____.

11. How are viruses named?

12. Circle the letter of each sentence that is true about viruses.

- a. They are larger than cells.
- b. They need to be inside a living cell in order to reproduce.
- c. They can be named after people.
- d. They infect only animals.

13. Label the two basic parts of a virus in this diagram



14. What are two functions of a virus's protein coat?

- a. _____
- b. _____

15. True or false? The shape of the proteins allows the virus's coat to attach to only certain cells in the host.

How Viruses Multiply

Match the kind of virus with the way it multiplies in a cell. Viruses may be used more than once.

How It Multiplies

Viruses

- _____ 16. The virus's genetic material becomes part of the cell's genetic material. a. active virus
b. hidden virus
- _____ 17. The virus immediately begins to multiply after entering cell.
- _____ 18. The virus stays inactive for a long time.
- _____ 19. the lysogenic cycle
- _____ 20. the lytic cycle

21. What are two illnesses in humans caused by viruses? _____ and _____

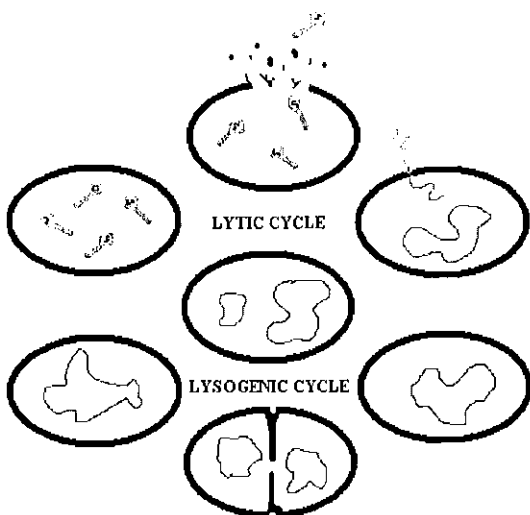
22. True or false? Viruses can cause diseases only in humans.

23. Name a virus that affects animals. _____

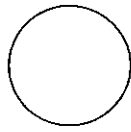
24. What is being used today to help people be able to handle the effects of viruses?

25. Scientists are using the virus's ability to enter into a cell in _____ to inject good DNA

to replace damaged DNA..



Fungi annotations



Name: _____

Date: _____ Class: _____ Seat# _____

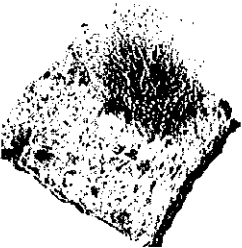
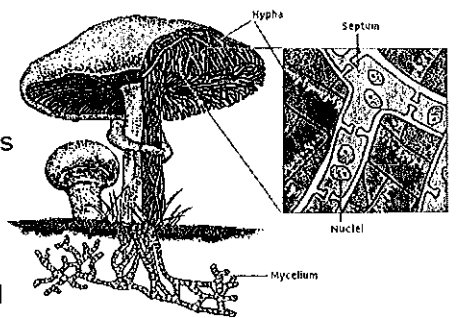


Figure 1 Bread with mold

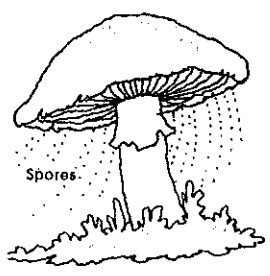
Did you know that the yeast that you use to make bread, and molds that grow on stale bread are classified in the same group as the mushrooms that sprout on your lawn? They all are in the **fungi kingdom**. Fungi are **eukaryotes** that have cell walls, are heterotrophs that feed

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*.

Even though fungi are classified as heterotrophs, they do not take food into their bodies like animals do. First, the fungus grows hyphae into a food source. **Hyphae** (singular hypha) are branching, threadlike tubes that make up the bodies of multicellular fungi. They absorb nutrients and other substances they need as they move through decaying tree bark, dead leaves, soil, and even old books. 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. (see fish below)



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. They break down the chemicals in dead organisms and this returns nutrients to the soil.

Yeasts are important in the preparation of foods such as bread. People also eat

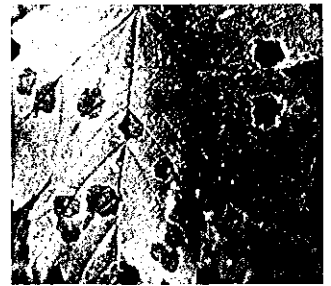
some types of fungi, such as mushrooms. Molds, such as *Penicillium*, make useful substances

that kill bacteria because of the ability to break down cell walls. The hyphae of some fungi grow

among the roots of plant which help the plant absorb more water and

nutrients from the soil. In return, the fungus feeds on extra food the plant

makes.



Blight on leaf



Toe fungus

There are disease-causing fungi, however, that are harmful to plants, people, and

other organisms. Plants are susceptible to blight which are spores that have spread over the leaves.

Many infect nails, skin, and lungs. Infections, caused by yeast, can grow inside a body. Ring worm, which is

not a worm, is caused by fungus, and so is athlete's foot. Animals, such as the

fish below, are also affected by fungi. Antifungal creams and sprays are used to

fight these diseases. Fungicides can be sprayed on plants or added to water.

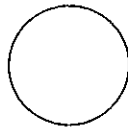


Fungus growing on fish



Baby with ringworm

Fungi



Name: _____

Date: _____ Class: _____ Seat# _____

1. Circle the letter before each sentence that is true about fungi.

- a. All fungi are multicellular organisms.
- b. Fungi are eukaryotes.
- c. Most fungi use spores to reproduce.
- d. Most fungi are autotrophs

2. What are three examples of fungi?

- a. _____
- b. _____
- c. _____

3. The cells of fungi are arranged in branching, threadlike tubes called _____.

4. Describe the process by which a fungus feeds.

5. True or False? Some fungi are parasites.

6. Most fungi reproduce by making _____.

7. Yeast cells reproduce asexually in a process called _____.

8. True or False? Fungi reproduce sexually when growing conditions become unfavorable.

10. Fungi that are _____ break down the chemicals in dead organisms.

11. True or False? All fungi are poisonous and should not be eaten by humans.

12. Which mold produces an antibiotic, a substance that kills bacteria? _____

13. From what you previously learned about the structure of bacteria, why are fungi able to kill them?

14. How do some fungi help plants grow larger and healthier?

15. True or False? Certain kinds of fungi cause diseases in plants and in humans, and other organisms.

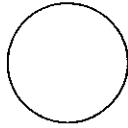
16. Plants can get _____ which is what occurs when the spores spread over their leaves.

17. True or False? Fungal diseases are restricted to just the outside of the body.

18. Name two diseases that occur in humans that are caused by fungi. _____ and _____.

19. What is used to kill fungal diseases? _____ and _____.

PROTISTS annotations

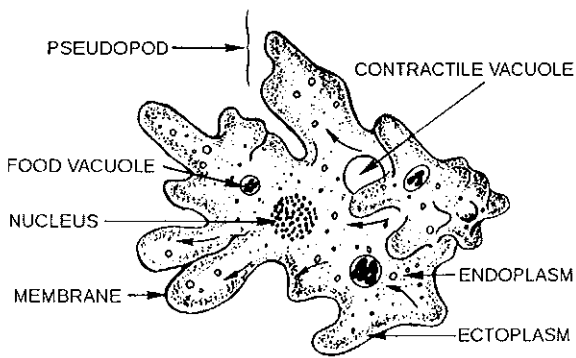


Name: _____

Date: _____ Class: _____ Seat# _____

Scientists like to put things into categories. We say there is a plant and animal kingdom. But there are other things that do not fit so neatly in these kingdoms. The protist kingdom is very diverse. All protists are **eukaryotes**, a cell with a nucleus that cannot be classified as animals, plants, or fungi. All live in moist surroundings. Most are unicellular, but some are multicellular. Some are heterotrophs, some are autotrophs, and some are both. Protists can be divided into three categories: animal-like, fungus-like, and plantlike protists.

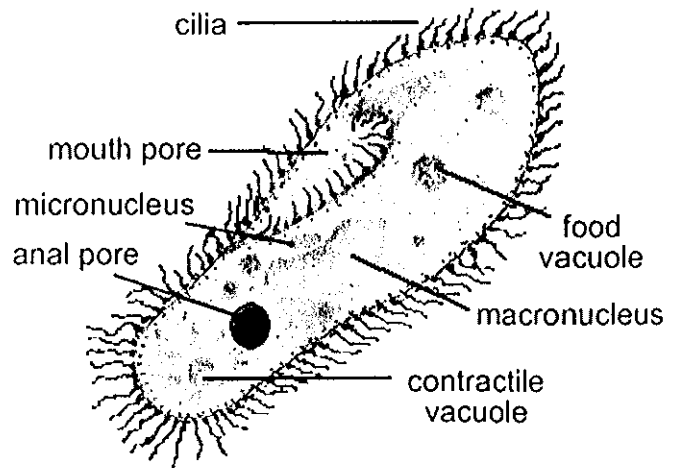
Like animals, animal-like protists are heterotrophs, and most are able to move from place to place to obtain food. Animal-like protists are also called protozoans. Protozoans can be divided into four types: sarcodines, ciliates, flagellates, and those that are parasites.



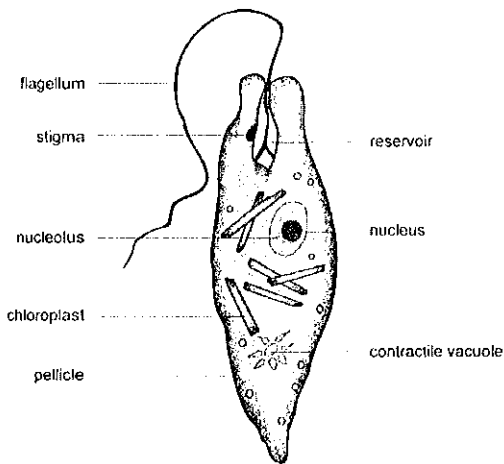
Sarcodines, such as amoebas, move and feed by using pseudopods, or false feet. Pseudopods are temporary bulges of the cell. Pseudopods form when cytoplasm flows toward one location and the rest of the organism follows. The sarcodines

engulfs other protists with their pseudopods in order to eat it in a process called endocytosis.

Ciliates have structures called **cilia**, which are hair-like projections that move with a wavelike motion. A **paramecium** is a ciliate. It has a slipper-like shape and contains 2 nuclei. One nucleus is used for cell functions, while the other is used for sexual reproduction called **conjugation**. Some protozoans that live in fresh water, such as amoebas and parameciums, have a **contractile vacuole**, which collects the extra water and expels it from the cell.



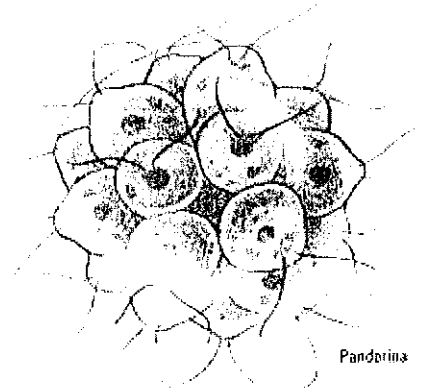
STRUCTURE OF A EUGLENA



Flagellates move using whip-like flagella. A euglena is an example of a flagellate. Another green algae protist, known as Volvox, moves by using special cells that are near the surface of the colony in which they live. These cells have two small flagella. Both flagellates contain chlorophyll by which they are able to perform photosynthesis, making them autotrophic.

However, if the euglena's red eye spot does not find sunlight, it will become heterotrophic.

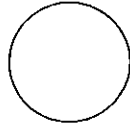
Some flagellates live inside the bodies of other organisms in a state of symbiosis. Symbiosis is a close relationship between two species where at least one of the species benefits. Sometimes, flagellates harm their hosts. In other cases, their relationship is one of mutualism, in which both partners benefit. Protozoans that are parasites feed on their hosts' cells and body fluids. They may also have more than one host. i.e malaria is caused by Plasmodium that affects a mosquito and then a human.



Plantlike protists are called algae. Like plants, algae are autotrophs. Algae can exist in a variety of colors because they contain many types of pigments-chemicals that produce color. Plantlike protists include diatoms, dinoflagellates, euglenoids, red algae, green algae, and brown algae. Diatoms have beautiful, glasslike cell walls. Dinoflagellates are covered by stiff plates and move using two flagella. A euglena has a red eye that looks for the sun so that it can produce its own food. When sunlight is not available, it becomes a heterotroph. Red algae and brown algae live in the oceans. Green algae live in fresh water, salt water, and moist places on land.

Like fungi, fungus-like protists are heterotrophs, have cell walls, and use spores to reproduce. Spores are tiny cells that are able to grow into new organisms. All fungus-like protists are able to move at some point in their lives. The three types of fungus-like protists are slime molds, water molds, and downy mildews. Slime molds live in moist soil and on decaying plants. Water molds and downy mildews grow as tiny threads in water or moist places.

PROTISTS worksheet



Name: _____

Date: _____ Class: _____ Seat# _____

1. Circle the letter of each sentence that is true about protists.
- a. All protists are eukaryotes, organisms that have cells with nuclei.
 - b. All protists live in dry surroundings.
 - c. All protists are unicellular.
 - d. Some protists are heterotrophs, some are autotrophs, and some are both.

2. List the three categories into which scientists group protists.

- a. _____
- b. _____
- c. _____

Animal like Protists

3. Circle the letter of each characteristic that animal-like protists share with animals.

- a. autotroph b. movement c. heterotroph d. unicellular

4. Another name for an animal-like protist is _____.

5. Describe how a sarcodine, such as an amoeba, gets food.

6. Circle the letter of the cell part in an amoeba that removes excess water.

- a. pseudopod b. cilia c. contractile vacuole d. cell membrane

7. True or False? Paramecia have more than one nucleus.

Match the animal like protist with the cell part it uses for movement.

Protist

- _____ 8. amoeba
- _____ 9. paramecium
- _____ 10. flagellate

Cell Part

- a. cilia
- b. flagella
- c. pseudopods

11. True or False? A euglena is a ciliate.

12. True or False? Flagellates living in symbiosis always harm the animal in which they live.

13. Protozoans that are _____ feed on the cells and body fluids of their hosts.

14. True or False? Protozoans that are parasites ever have more than one host.

Plantlike Protists

15. Plantlike protists are commonly called _____.

16. Like plants, plantlike protists are _____ ; they make their own food.

Fungus like Protist

17. Circle the letter of each sentence that is true about fungus-like protists.

- a. Like fungi, fungus-like protists are heterotrophs.
- b. Fungus-like protists do not have cell walls.
- c. Fungus-like protists use spores to reproduce.
- d. Fungus-like protists never move during their lives

18. List the three types of fungus-like protists.

19. Where do most water molds and downy mildews live? _____

20. Circle the letter of each place where slime molds live.

- a. dry soil
- b. decaying plants
- c. moist soil
- d. in animals

Review:

- _____ 1. protozoan
- _____ 2. pseudopod
- _____ 3. spore
- _____ 4. contractile vacuole
- _____ 5. cilia
- _____ 6. algae
- _____ 7. symbiosis
- _____ 8. mutualism
- _____ 9. pigment
- _____ 10. protist
- _____ 11. volvox
- _____ 12. paramecium
- _____ 13. amoeba
- _____ 14. euglena
- a. a form of symbiosis that benefits both species
- b. a green algae that lives in colonies
- c. a tiny cell that is able to grow into a new organism
- d. uses pseudopods to move and capture food
- e. a temporary bulge of the cytoplasm used for feeding and movement
- f. hair like projections of ciliates that are used to sweep in food and move
- g. plantlike protists
- h. structure that collects excess water and expels it from a cell
- i. a eukaryote that cannot be classified as an animal, plant, or fungus
- j. close relationship between two species where at least one of the species benefits
- k. an animal-like protist
- m. a chemical that produces color
- n. autotrophic flagellate that can also be heterotrophic
- o. uses cilia to move and has two nuclei