Lesson 1

What Are Germs?

Hilleman & Vaccines

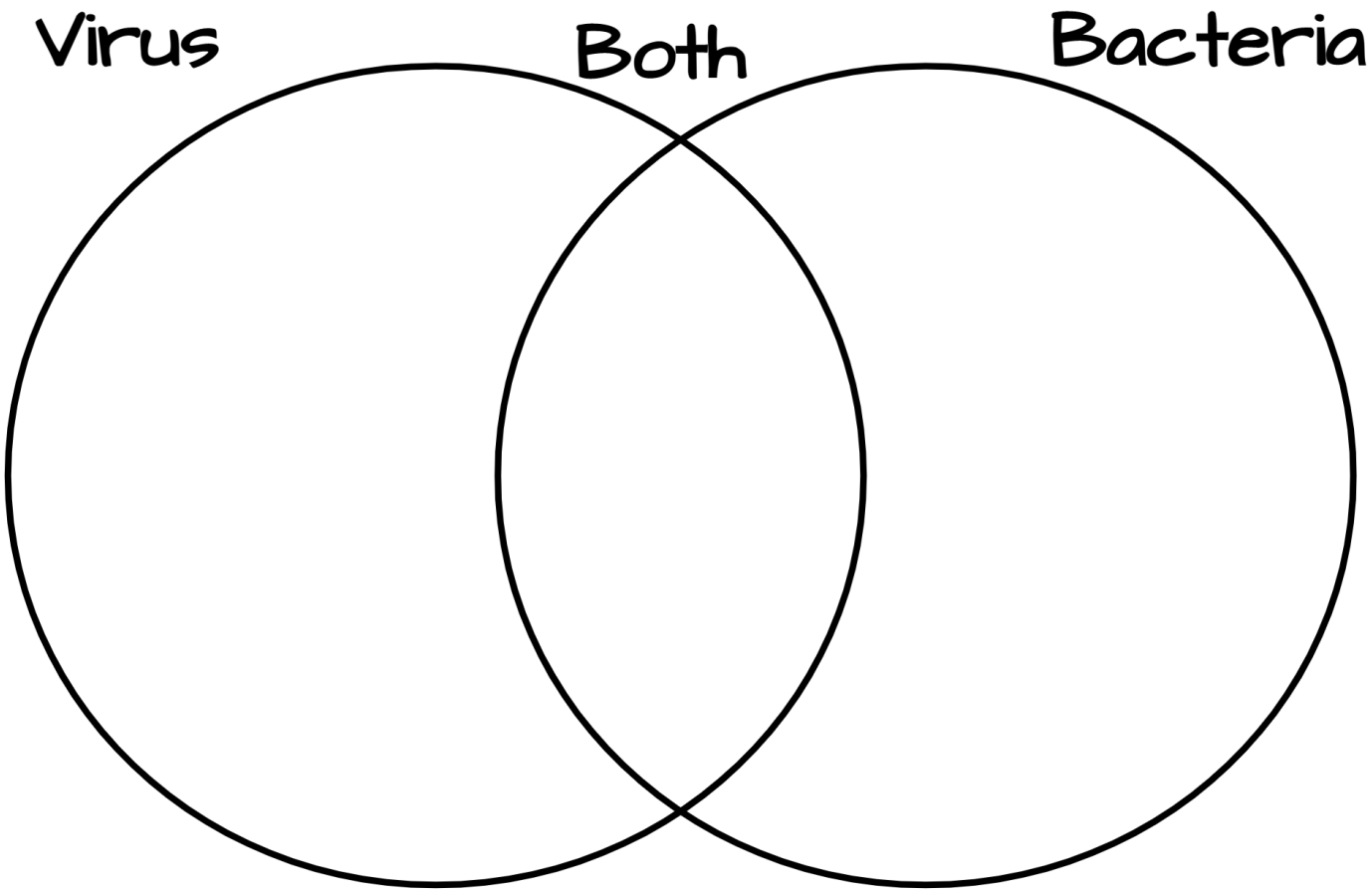
Student Pages

Vocabulary

Match each word in Column A with its definition in Column B.

Column A	Column B
_____**Antibiotic**	A. an illness that has been caused by germs
_____**Bacteria**	B. to send, spread, or pass on
_____**Contagious**	C. tiny organisms (microorganism or living thing) which can be found everywhere. Some of them are harmless, some of them are helpful, and some of them can cause diseases
_____**Germ**	D. a medicine which destroys bacteria
_____**Infection**	E. a tiny germ which causes disease and can only live in the body of another living thing
_____**Organism**	F. illness able to be passed from person to person
_____**Transmit**	G. a living being, a form of life
_____**Virus**	H. a microorganism that causes disease

Name: _____ **Date:** _____



Name: _____ **Date:** _____

Virus or Bacteria?

Cut and glue each concept in the correct box.

Virus	Bacteria	Both

✂

Reproduces by dividing into two cells	Infects cells to reproduce	Can cause disease	Vaccines can prevent disease
Living organism	Much smaller	Not affected by antibiotics	Do not have a nucleus

Name _____

UNDERSTANDING VIRUSES

Within the world of germs, there is one kind of germ called a virus. The virus is different from bacteria and protists (algae and amoebas), because it does not have a cell membrane, nor is it a cell at all. Viruses have a protein coat called a capsid to surround them and they only have DNA or RNA on the inside of the protein coat. The DNA or RNA carries all of the information needed to make more of the virus.

Because viruses lack three of the requirements to be considered life, scientists consider them to be nonliving. Viruses do not require energy (they do not take in food or use sunlight to make food), viruses are not cellular (made of one or more cells), and viruses do not reproduce on their own. In order to reproduce, viruses must use cell parts from an actual organism (host) to make their virus pieces.

By attaching themselves to cells, in organisms like plants, animals, and bacteria, viruses can inject their DNA or RNA into the cells. Then, the cell's organelles do all of the work to make copies of the viral DNA or RNA and to make new protein coats. Diseases occur in the organisms when the viruses are reproduced so much that the cells rupture (burst open), become entirely dysfunctional, or the virus causes problems around the cells. For example, human immunodeficiency virus (HIV) ruptures white blood cells until the host has no immune system left. The chickenpox virus settles near the skin's surface and makes sores filled with more of the virus. For viruses that cause pneumonia, they can cause fluid to build up where it should not, like in the lungs.

The chickenpox virus is then spread when the skin sores begin to leak and the virus comes in contact with more humans. Viruses move and spread to new hosts by organisms touching each other, ingesting virus-contaminated foods or liquids, or through bodily fluids like mucus (snot), or respiratory droplets from your mouth and lungs (coughing or sneezing). Viruses can also be spread to humans from animals like when humans catch rabies from a bite, scratch, or contaminated piece of food, or West Nile virus from mosquito bites. Viruses can be easily spread and difficult to detect because they are much smaller than bacteria.

Name _____

VIRUS FOLLOW-UP QUESTIONS

1. Describe viruses:

2. What is the protein coat of a virus called and what is found inside the protein coat?

3. Give three reasons why viruses are considered nonliving.
   1.
   2.
   3.

4. Explain two ways that viruses can cause diseases.
   1.
   2.

5. List three ways that viruses can spread between hosts.
   1.
   2.
   3.

Name _____

UNDERSTANDING BACTERIA

Bacteria are single-celled organisms, meaning that each cell lives mostly alone. They have a cell membrane and a cell wall on the outside, but they do not have organelles with membranes around them, like the nucleus or mitochondria that plants and animals have. Their DNA is in a circular shape and they do have ribosomes for making proteins like plants and animals. Bacterial cells are about ten times smaller than typical plant and animal cells.

Bacteria can have many shapes like rods, spheres, and spirals, and they can form chains or clusters with each other. These properties and their types of cell walls help us classify bacteria. For example, streptococcus are chains of round bacteria. Strepto- means chains and -coccus means round. Under a microscope, a staph infection would be recognized by the bacteria clumped together in clusters like grapes.

Although you typically think of strep as being bad, some bacteria are good and some cause disease. Skin contains a natural layer of bacteria that protects the body from incoming diseases and keeps the skin at a steady pH level (acidic or basic). If the bacteria on the skin die off, the skin becomes more basic and fungi can grow (yeast or athletes' foot). The stomach and digestive system also have bacteria that keep them healthy and functioning well. Cows have special bacteria that release the sugars from plant cellulose. This is how they can get so much energy from grass, but we cannot. Other bacteria help recycle or add nutrients to the soil. Decomposers break down dead plants and animals and cause the rotting scents. Truly, plants and animals cannot live without bacteria.

The dangerous bacteria are the ones that can make us sick. In that case, we call them pathogens. For instance, there is a kind that causes strep throat and one that causes salmonella. Bacteria can also cause pneumonia or tetanus, but unlike viruses, bacteria can be killed with antibiotics. Antibiotics are medications capable of killing cells by disrupting the cell membranes. In other words, these diseases are treatable, but we do not want to kill all bacteria so we have to be careful.

Name _____

BACTERIA FOLLOW-UP QUESTIONS

1. Describe bacteria:

2. Name two diseases caused by bacteria.
   1.
   2.

3. List three things that bacteria are good for.
   1.
   2.
   3.

4. What is an antibiotic and what can't they be used on?

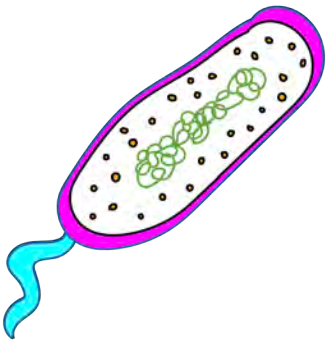
5. What kind of bacteria break down dead things and return nutrients to soil?

STUDENT PAGE (6TH - 8TH GRADE)

Lesson 1: What are germs?

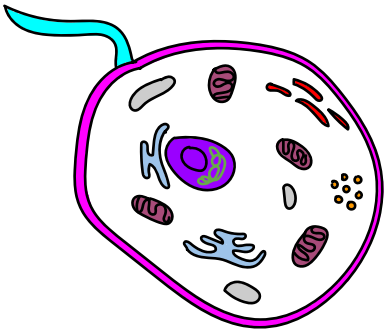
Name: _____ **Date:** _____

Below are three different types of cells. The word banks below the images list the cell parts, which correspond to a specific color in the image. Look at the images then answer the questions at the bottom of the page.



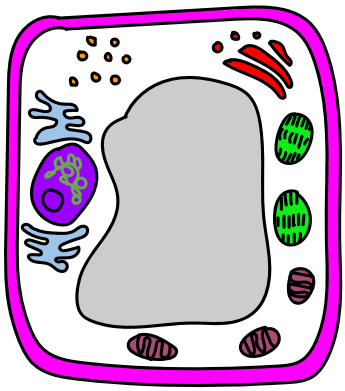
Bacteria Cell

Cell wall
Cell membrane
Flagella
Circular DNA
Ribosomes



Animal Cell

Cell membrane
Flagella
Golgi apparatus
Mitochondria
Nucleus
DNA
Ribosomes
Vacuole
Endoplasmic reticulum



Plant Cell

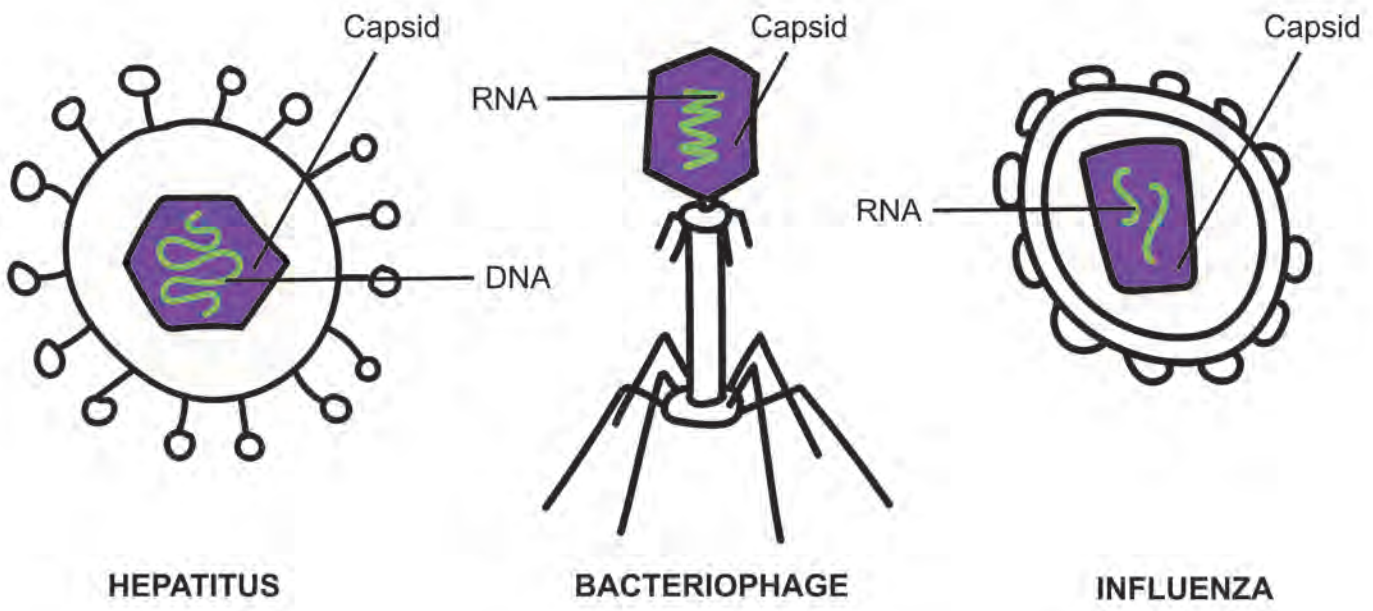
Cell wall
Cell membrane
Flagella
Golgi apparatus
Mitochondria
Nucleus
DNA
Ribosomes
Vacuole
Endoplasmic Reticulum
Chloroplasts

1.What parts do all cells have in common?

2.What are the differences?

Name: _____ **Date:** _____

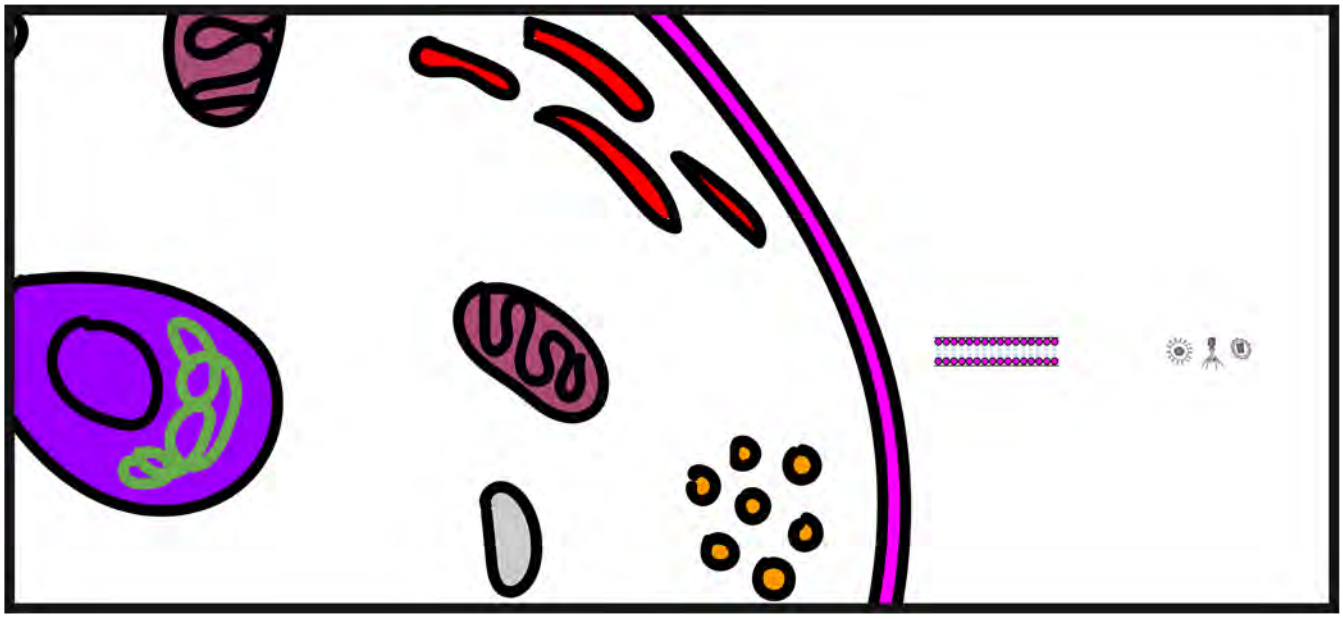
Below are three different types of viral capsids. Look at the images and compare them to the cells on the previous page. What are some differences? Similarities?



Viral Capsids

Notes:

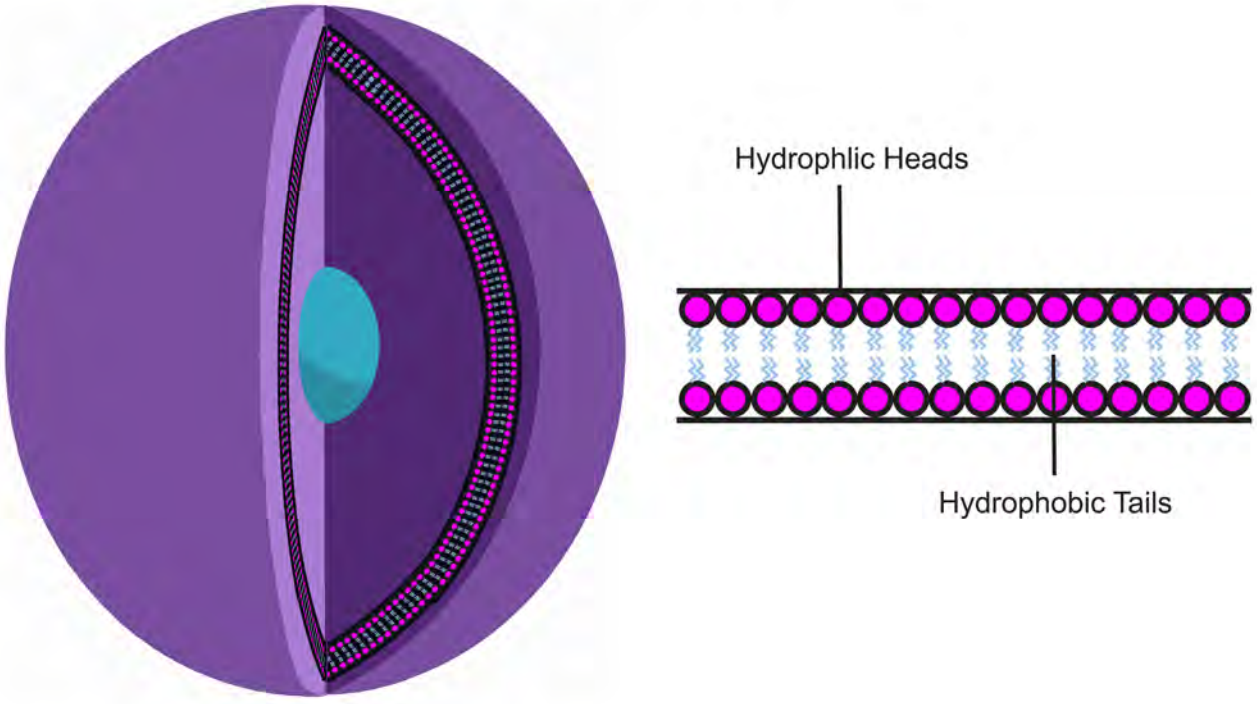
Name: _____ **Date:** _____



Above is a size comparison of cells and viruses. What differences do you notice?

Name: _____ **Date:** _____

PHOSPHOLIPID BILAYER



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