

Life Science

S7L1. Students will investigate the diversity of living organisms and how they can be compared scientifically.

b. Classify organisms based on physical characteristics using a dichotomous key of the six kingdom system (archaebacteria, eubacteria, protists, fungi, plants, and animals).

Agenda: Viruses Unit 3 Test Results

Reminder: Retest offered this week.

Essential Questions: What do the levels of classification indicate about the relationship between organisms? How do viruses compare to organisms?

Warm- up:

1. What do you know about viruses?
2. What are at least 2 questions that you want to find the answers to about viruses?

Big Ideas

How do viruses compare to organisms?

How do viruses meet their needs?

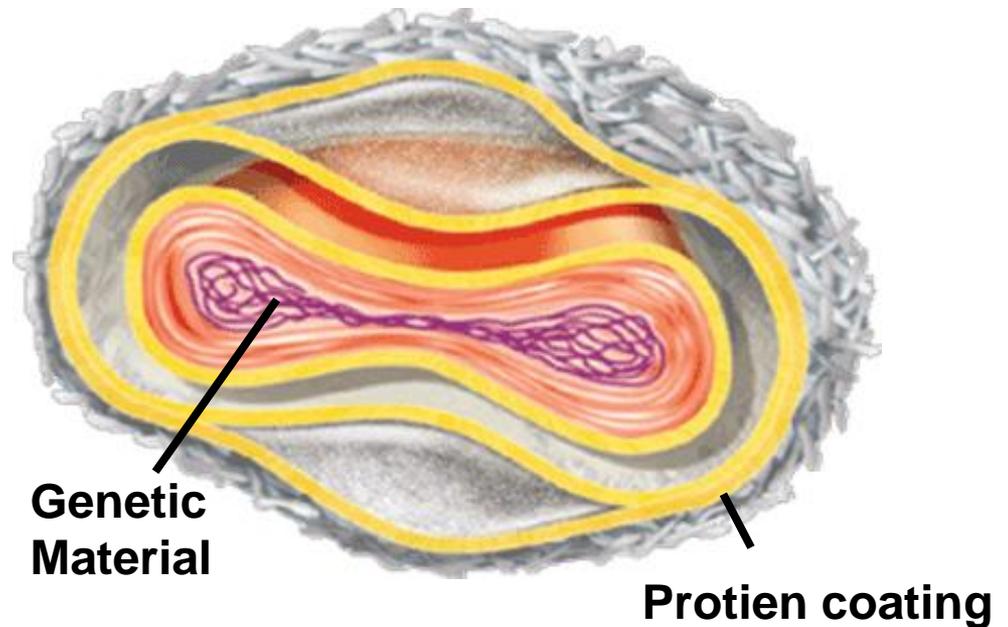
How do viruses reproduce?

How do viruses affect people and other living things?

Can viruses be prevented?

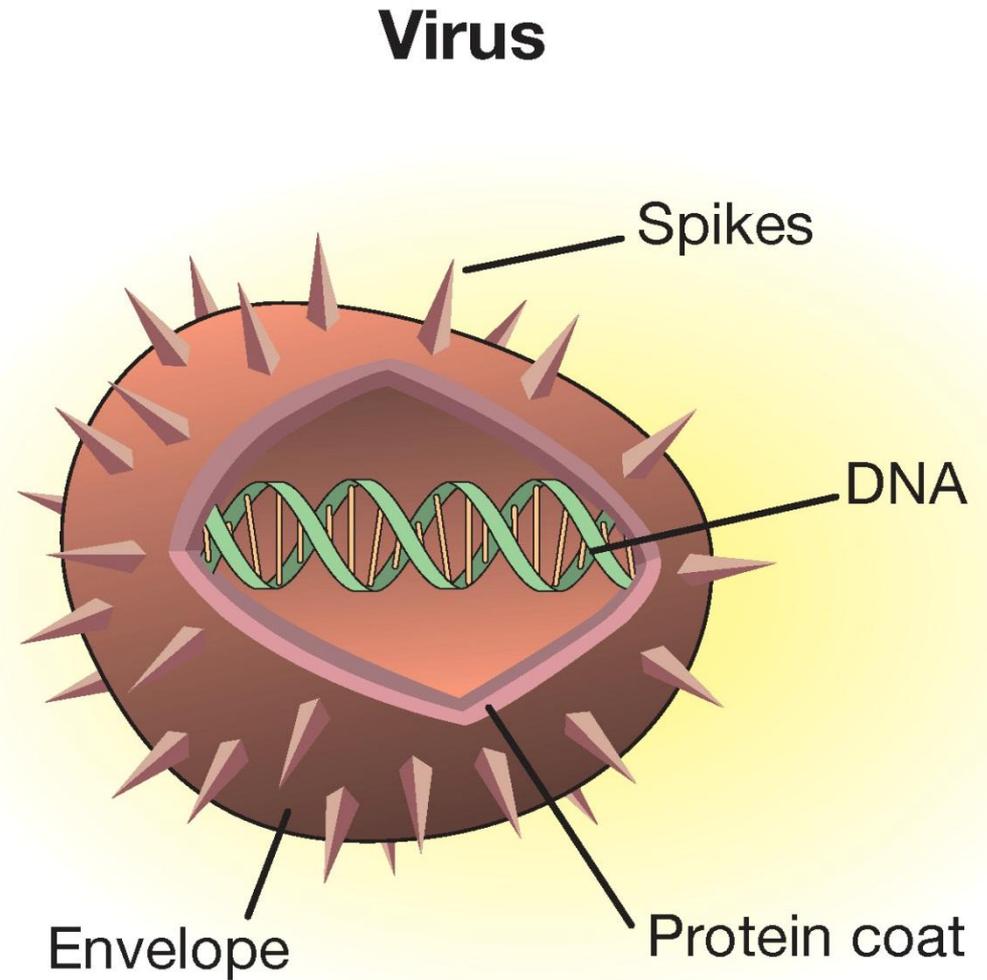
What are viruses?

- A **virus** is a strand of hereditary material surrounded by a protein coating. Viruses don't have a nucleus, other organelles, or a cell membrane.



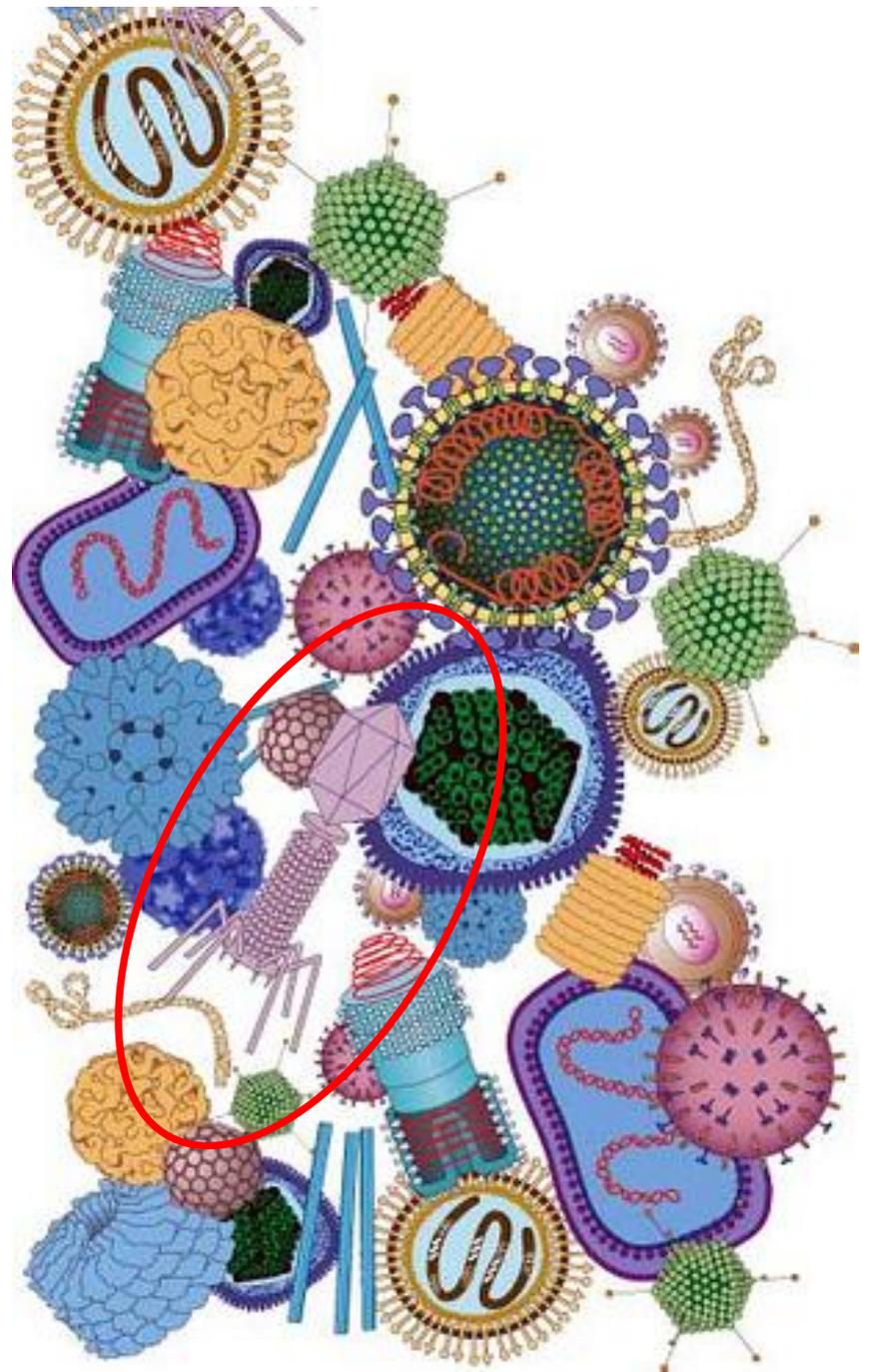
How do viruses compare to organisms?

- Viruses are **not cells** and are not made of cells.
- A virus is a tiny particle made up of genetic material and protein.



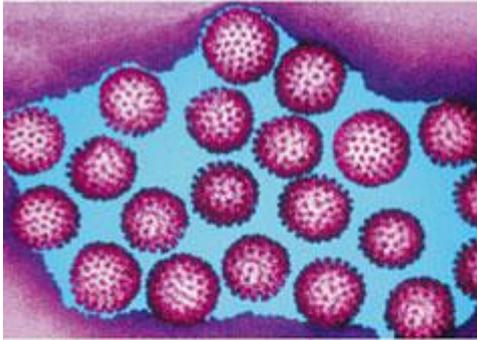
Viruses have a variety of shapes.

- Viruses are smaller than cells and vary in size and shape.
- Some viruses are round. Others are shaped like rods, bricks, threads, or bullets.
- There are even viruses that have complex, robot-like shapes, such as the bacteriophage

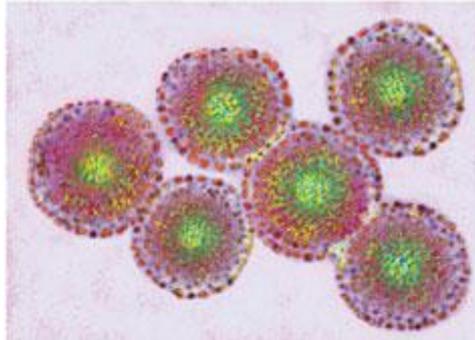


How large are viruses?

Rotavirus



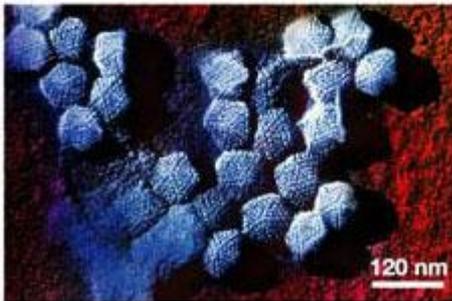
Avian influenza



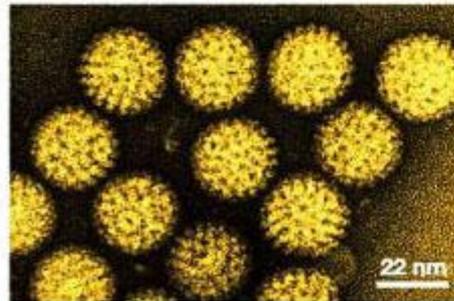
Ebola virus



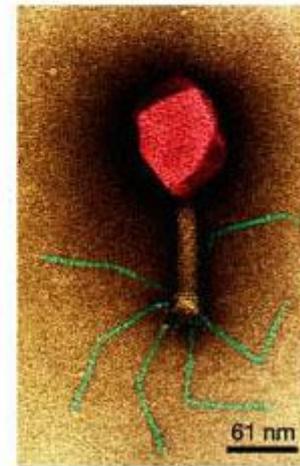
tobacco mosaic virus



adenovirus



influenza virus



bacteriophage T4

About **20 million** will fit on the end of a pin 1mm in diameter.

Compared to a bacteria?

Bacteria are **2.5 to 50 times larger (1000nm)** Most Viruses: (20 - 400nm)

How do viruses multiply?

- Viruses **cannot** reproduce on their own, but they use materials within living cells to make copies of themselves.
- They must have the help of a living cell called a **host cell**.
- Viruses act like **parasites**, organisms that live on or in a host and cause it harm. Almost all viruses destroy their host cells.



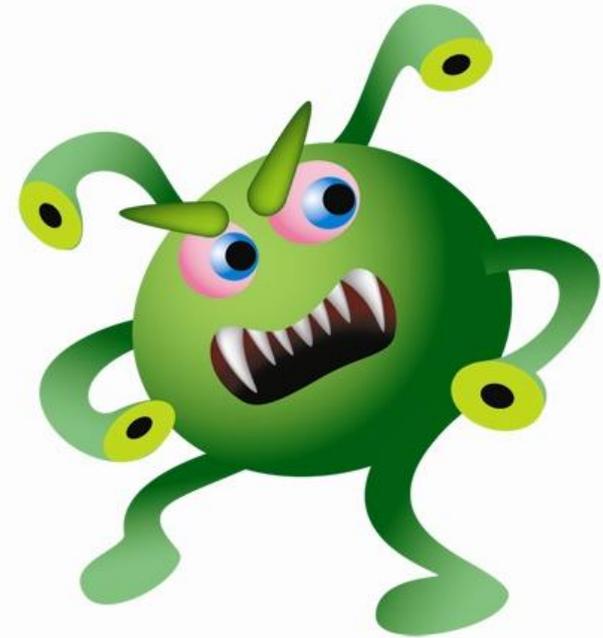
**Reproducing viruses
caused this cell to burst.**

Is a virus a living organism?

Remember: All living things have a cellular organization, contain similar chemicals, use energy, respond to their surroundings, grow and develop, and are able to reproduce.

• ***So, does a virus meet all that criteria?***

No, they are not made of cells and cannot reproduce without a host.

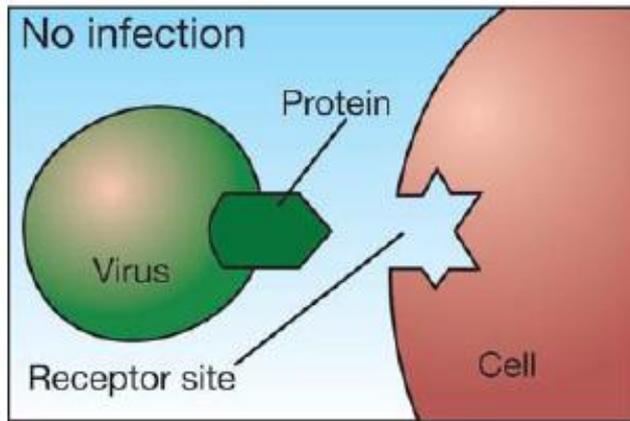
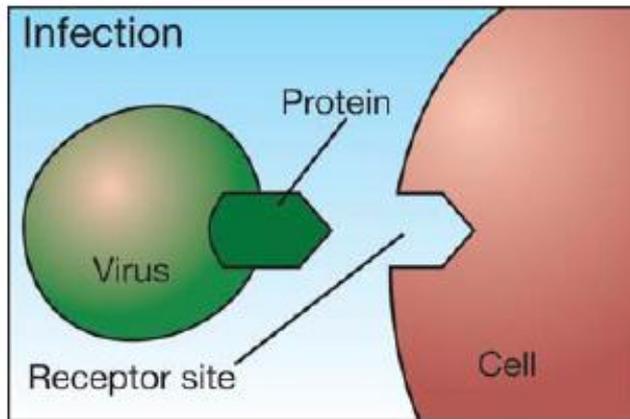




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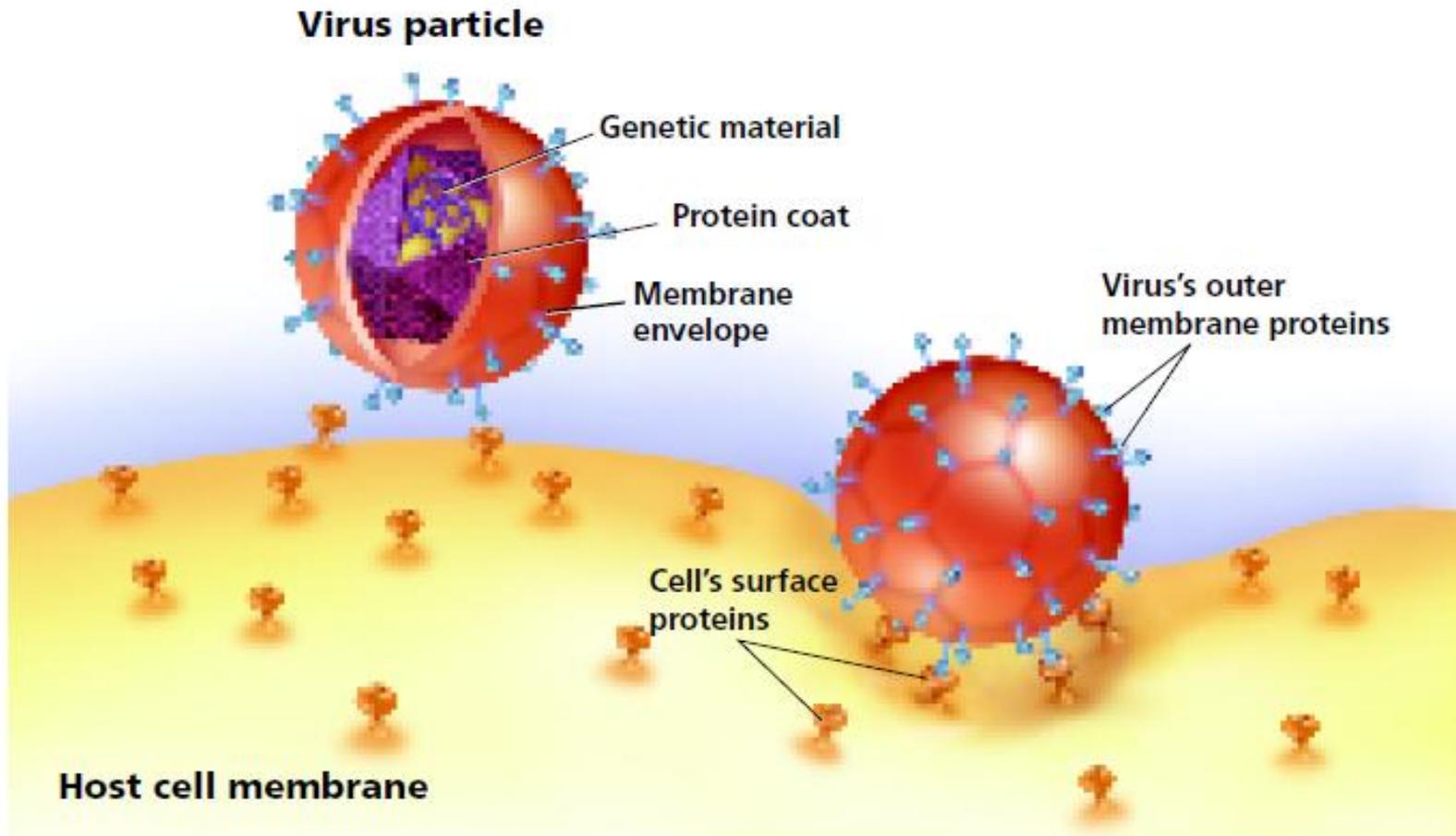
- **host cell**: a living thing that provides a source of energy for a virus or an organism.
- **parasite**: organisms that live on or in a host and cause it harm

How do viruses infect cells?



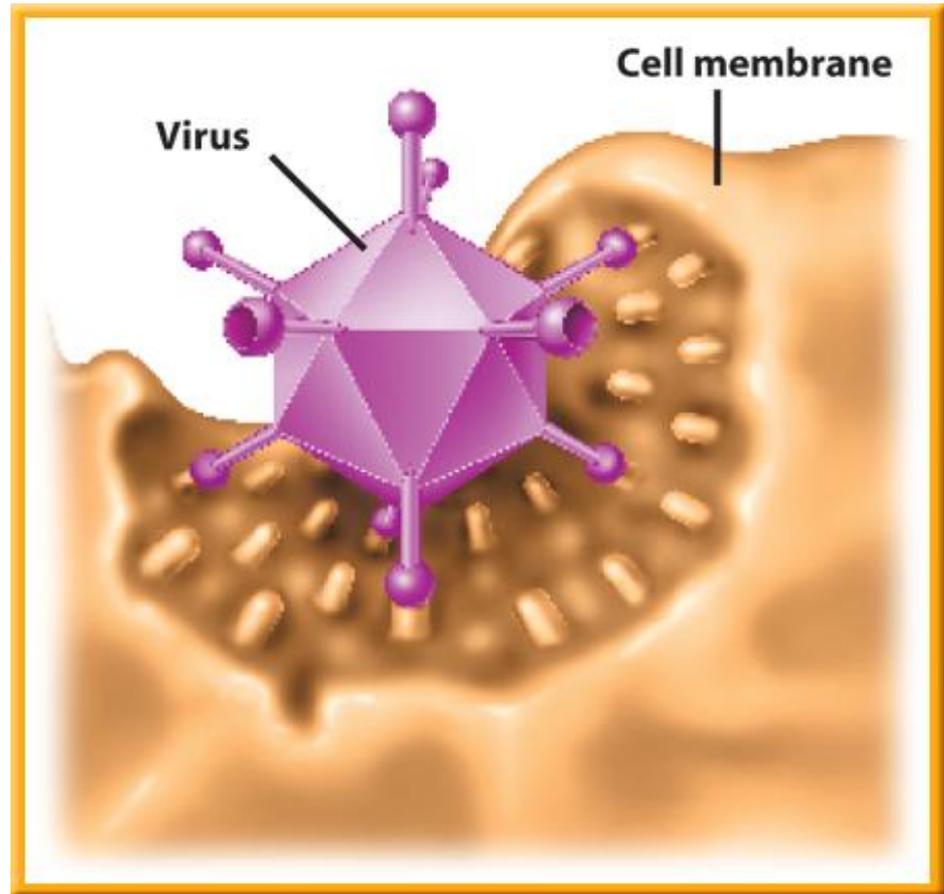
- A virus must be able to get its DNA inside of a cell before it can multiply.
- How does a virus trick a cell into letting it enter?
- A “lock and key” mechanism is the most common explanation.

Virus Structure and Infection



How many organisms do viruses affect?

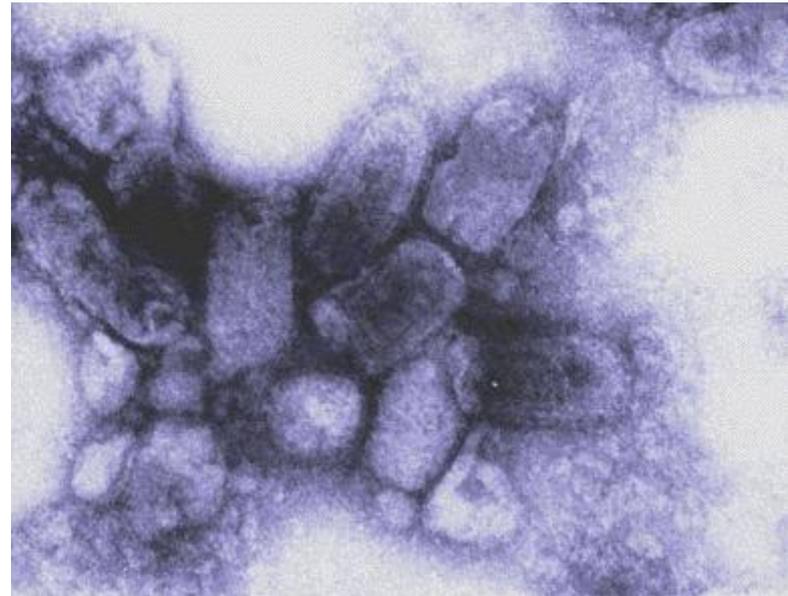
- The virus and the place where it attaches must fit together exactly.
- Because of this, most viruses attack *only one kind of host cell.*



How do viruses affect organisms?

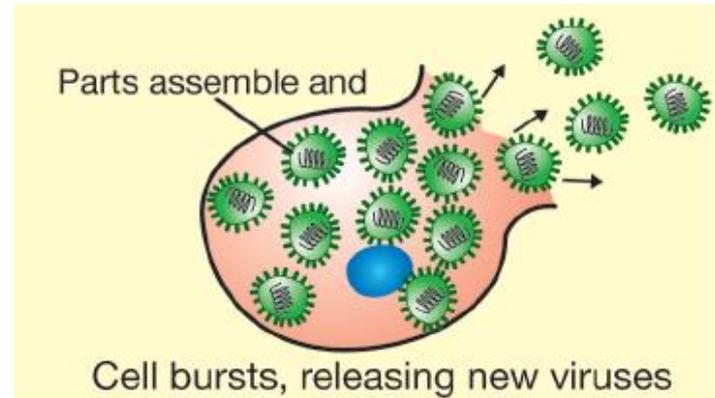
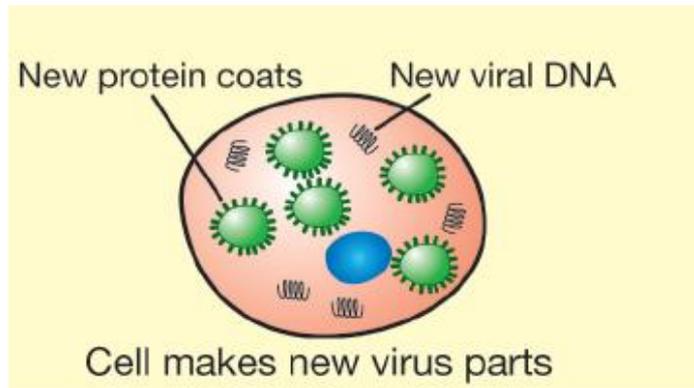
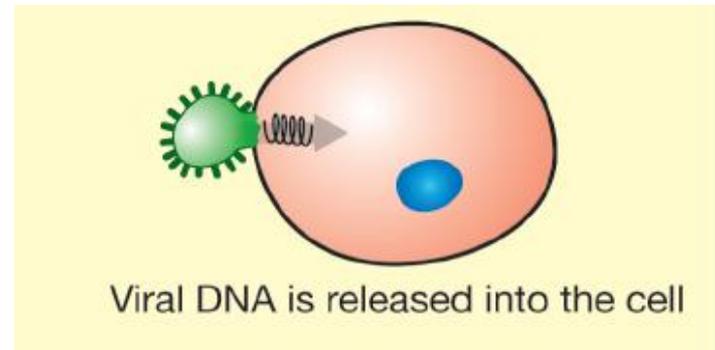
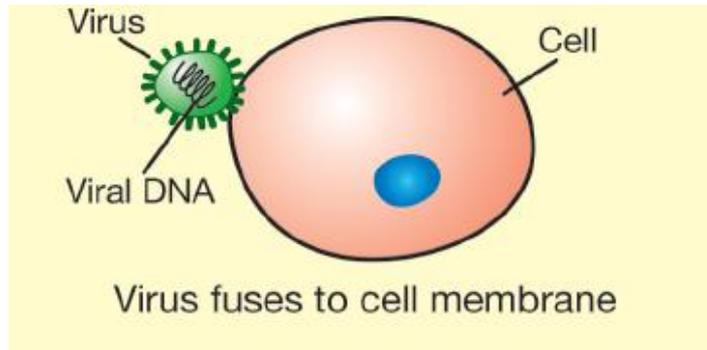
- Viruses may attack animals, plants, fungi, protists, and all prokaryotes.
- Some viruses can infect only specific kinds of cells.
- Many viruses are limited to one host species or to one type of tissue within that species.
- A few viruses affect a broad range of hosts.

Example: Rabies Virus



How do viruses multiply?

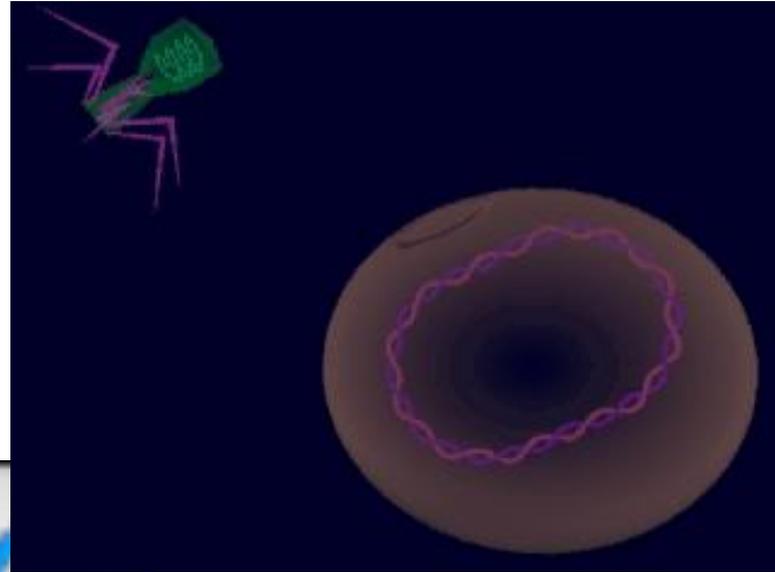
- Once inside, viral DNA instructs the cell to become a virus factory.



- After a virus is inside of a host cell, the virus can act in **two** ways.
- It can either be **active** or it can become *latent*, which is an **inactive** stage.

Active Viruses

- When a virus enters a cell and is active, it causes the host cell to make new viruses.
- This process destroys the host cell.

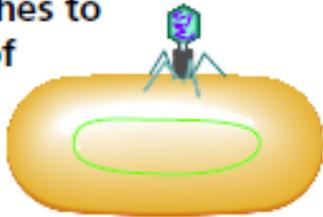


LS0035AA.avi

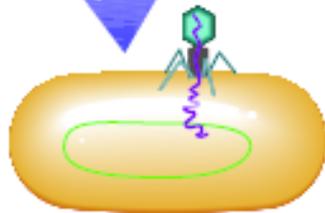
Active Viruses link:

Active Virus

- 1 A virus attaches to the surface of a bacterium.

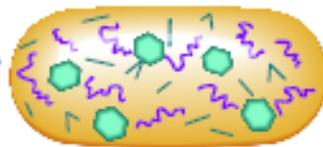


- 2 The virus injects its genetic material into the bacterium.

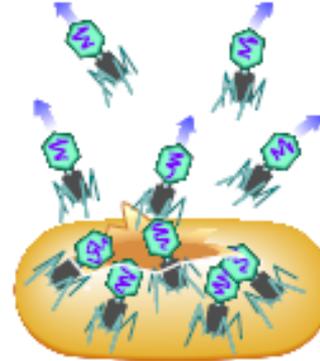


Active Virus

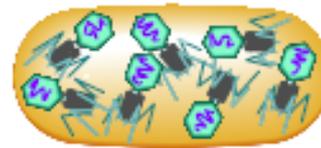
- 3 The virus's genetic material takes over the cell functions of the bacterium. The cell starts to produce the virus's proteins and genetic material.



- 5 The bacterium bursts open, releasing new viruses. The viruses go on to infect more cells.

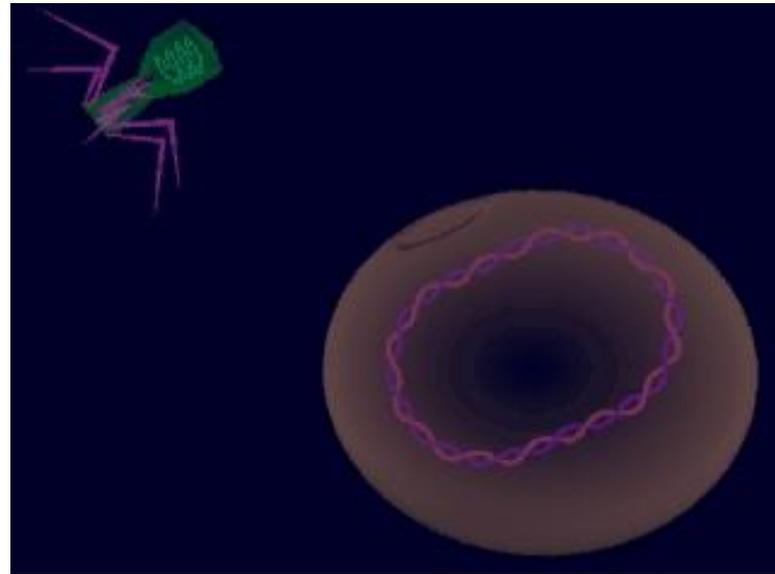


- 4 The proteins and genetic material assemble into new viruses that fill the bacterium.



Inactive or Latent Viruses

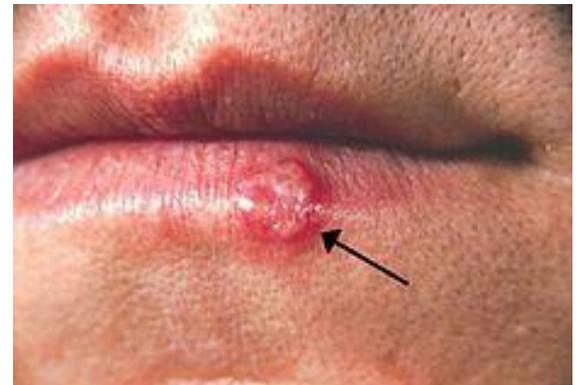
- Some viruses can be latent, which means that after it enters a cell, its hereditary material can become part of the cell's.
- It does not immediately make new viruses or destroy the cell.
- As the host cell reproduces, the viral DNA is copied.



Inactive Virus Link: [LS0034AA.avi](#)

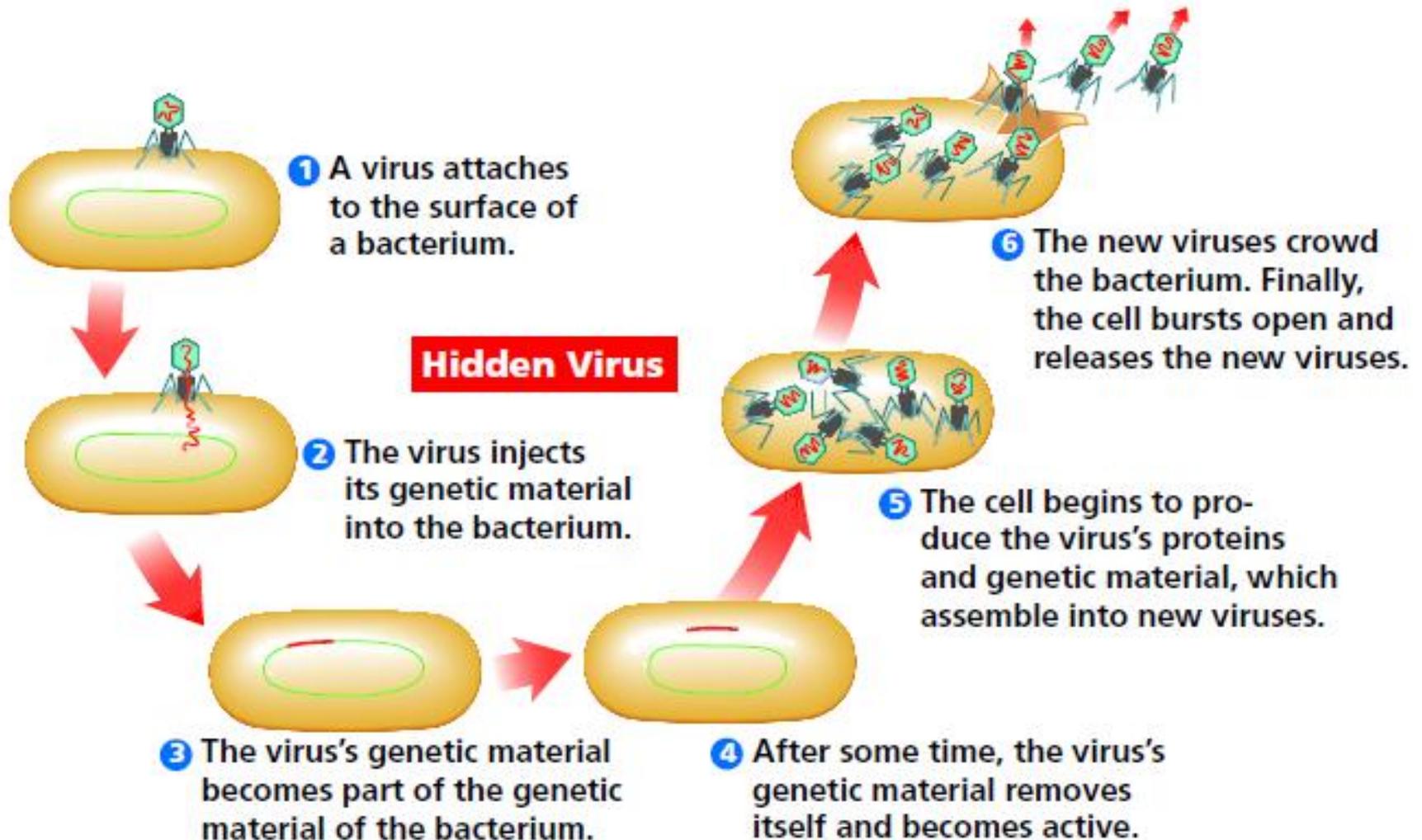
Inactive or Latent Viruses

- Crystallized forms of some viruses can be latent for many years.
- Then, at any time, certain conditions can activate the virus.
- If you have had a cold sore on your lip, a latent virus in your body has become active.



Herpes simplex

Hidden / Latent Virus



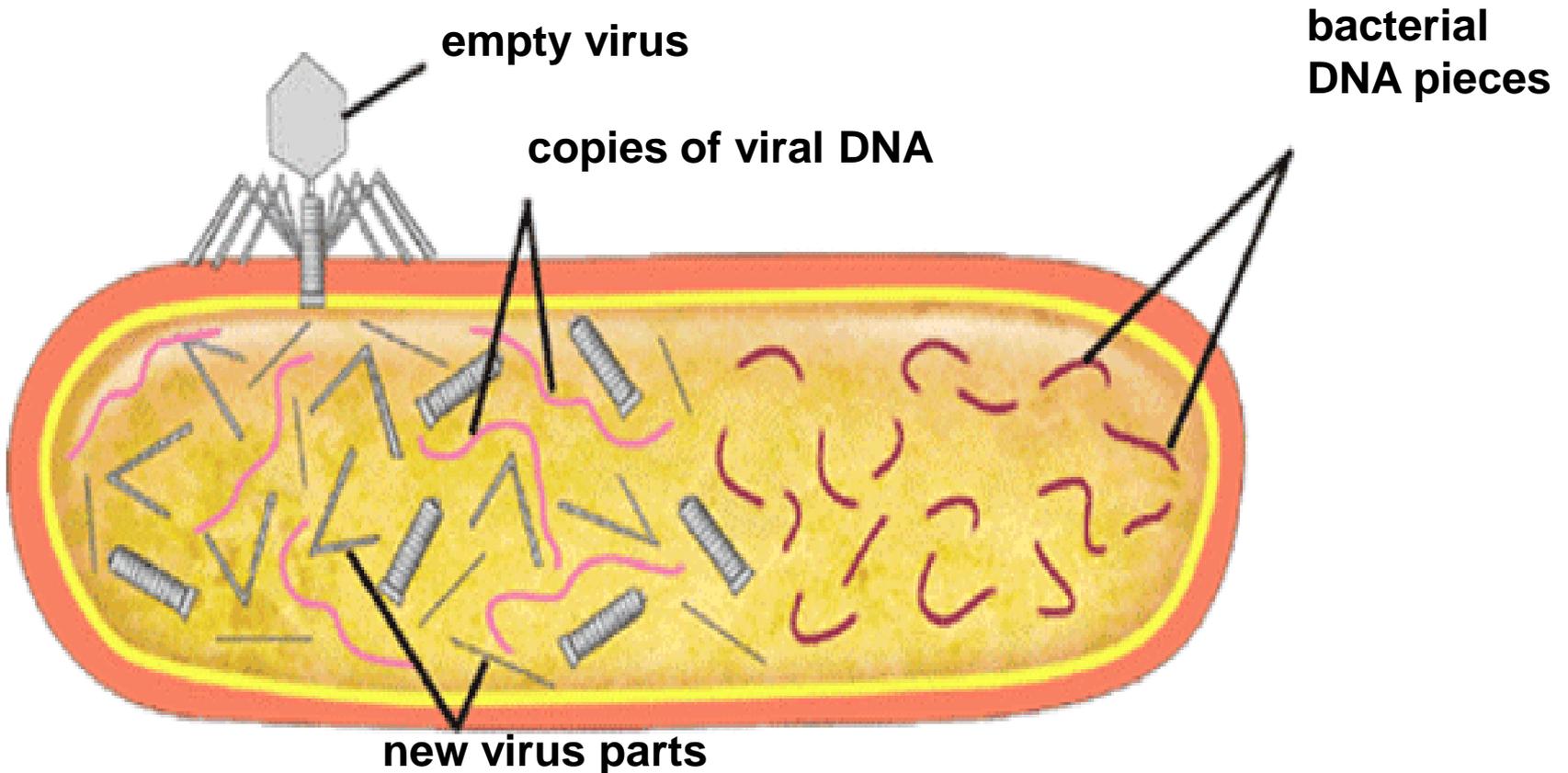
How do viruses affect organisms?

- Viruses that infect bacteria are called **bacteriophages** (bak TIHR ee uh fay jihz).
- In fact, its name means “bacteria eater.”
- Bacteriophages attach to a bacterium and inject their hereditary material. The entire cycle takes about 20 min, and each virus-infected cell releases an average of 100 viruses.



Bacteriophage

[bak-teer-ee-uh-feyj] *“feyj” rhymes with page*

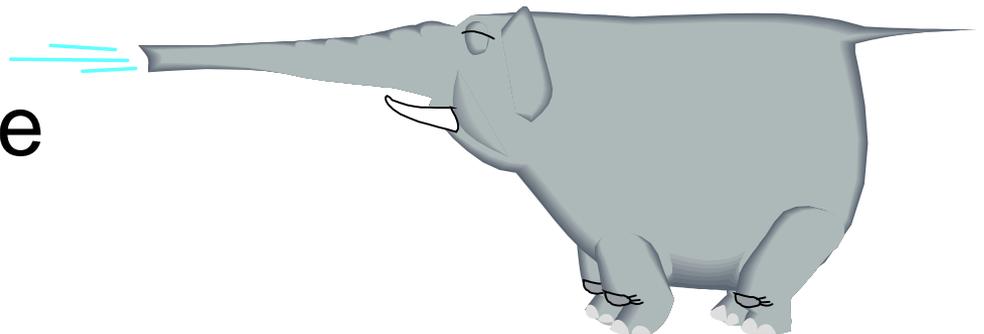


http://www.phschool.com/atschool/phsciexp/active_art/virus/index.html



How do viruses reach organisms?

- A virus *cannot move by itself*, but it can reach a host's body in several ways.
- It can be carried onto a plant's surface by the *wind* or it can be *inhaled* by an animal.
- So, covering your mouth & nose when you sneeze or cough is *important!*



How can we fight viruses?

- *Vaccines* are used to prevent disease.
- A vaccine is made from weakened virus particles that can't cause disease anymore.
- Vaccines have been made to prevent many diseases, including measles, mumps, smallpox, chicken pox, polio, and rabies.



Treating Viral Diseases

- Antibiotics treat *bacterial* infections but are *not* effective against viral diseases.



Preventing Viral Diseases

- Public health measures for preventing viral diseases includes:
 - Vaccinating people
 - Improving sanitary conditions
 - Quarantining patients
 - Controlling animals that spread disease
 - Private citizens can also vaccinate pets and farm animals.



VOCABULARY

- **Bacteriophages** (bak TIHR ee uh fay jihz):
Viruses that infect bacteria
- **Vaccine:** made from weakened virus particles that can't cause disease anymore

What research is being done with viruses?

- Through research, scientists are discovering **helpful** uses for some viruses.
- **Gene therapy** substitutes normal hereditary material for a cell's defective hereditary material.

Question 1

A _____ is a nonliving strand of hereditary material surrounded by a protein coating.

Answer

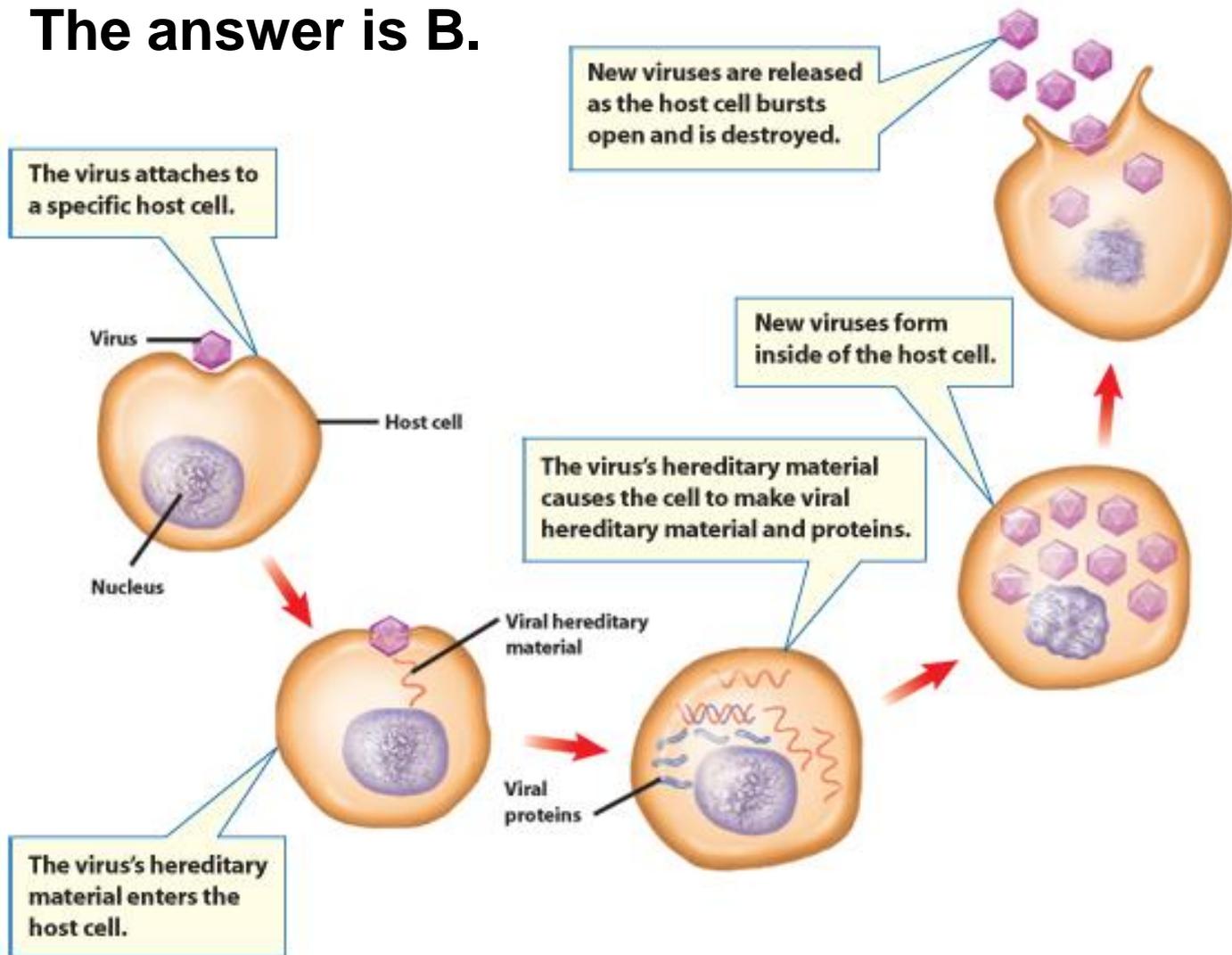
The answer is virus. Viruses **do not** have a nucleus or other organelles.

Question 2

Which happens to the host cell after the active virus is duplicated and released?

- A. It divides through cell division.
- B. It is destroyed.
- C. It functions normally.
- D. It continues to produce more and more new viruses.

The answer is B.



Latent, or inactive, viruses do not destroy the host cell until they become active.



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- **immune system** - a system that protects an organism from unfamiliar objects like viruses.
- **antibodies** - proteins that bind to viruses and prevent them from infecting cells.

Extra Info

- See following slides.

- One way your body can stop viral infections is by making interferons.
- Interferons are proteins that are produced rapidly by virus-infected cells and move to noninfected cells in the host.

Treating Viral Diseases

- Interferons cause the noninfected cells to produce protective substances.
- Antiviral drugs can be given to infected patients to help fight a virus.
- A few drugs show some effectiveness against viruses but some have limited use because of their adverse side effects.

Preventing Viral Diseases

- Annual rabies vaccinations of pets and farm animals protect them and humans from infection.
- To control the spread of rabies in wild animals such as coyotes and wolves, wildlife workers place bait containing an oral rabies vaccine where wild animals will find it.

The First Vaccine

- Edward Jenner is credited with developing the first vaccine in 1796.
- He developed a vaccine for smallpox, a disease that was still feared in the early twentieth century.
- Jenner noticed that people who got a disease called cowpox didn't get smallpox.

The First Vaccine

- He prepared a vaccine from the sores of people who had cowpox.
- When injected into healthy people, the cowpox vaccine protected them from smallpox.
- Jenner didn't know he was fighting a virus.
- At that time, no one understood what caused disease or how the body fought disease.

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Section Check

Question 3

Who developed the first vaccine?

- A. Edward Jenner
- B. Gregor Mendel
- C. Reginald C. Punnett
- D. Theodor Schwann