2020

Erie Rise Leadership
Academy Charter School

Parent Lesson Plan

[PARENT LESSON PLAN]

8th Grade, Week of 4/6

Contents

INTRODUCTION

Hello Parents!

Included in this packet is a week's worth of printed ELA, Mathematics, and Science/Social Studies work for your students while they are at home. Each day is separated into the 3 content areas for the printed material. If you have access to the digital curriculum, a pacing guide is also provided outlining the digital component assigned for each specific day. If you need technology, please contact the school and we can make it available to you. Also remember, USATestPrep is always an option!

We know some of this material maybe be challenging, but try your best to complete it! Hopefully we will see you back in the classroom soon and will be able to go over all the information.

Printed materials may be turned into to the distribution centers once completed, but it is not a requirement.

Mrs. Will will be available on Youtube Live every day from 10AM-11AM to assist with curriculum questions and/or any resource questions for parents or students.

Stay safe and healthy everyone!

Missing seeing everyone's smiling face! Remember to wash your hands!

Educationally Yours ,
Mrs. Veronica Will

HELPFUL INFORMATION

Distribution Sites/Information

Food/Curriculum distribution will take place at:

Erie Rise Leadership Academy Charter School
1006 West 10th Street
Erie, PA 16502

Monday and Wednesday from 9AM until 12PM

Leadership Team

Mr. Terry Lang, CEO: 814 812-0503
Mrs. Veronica Will, Principal: 814 873-5158
Mr. Aubrey Favors, HR: 814 812-3026
Mr. Kirk Paskell, Transportation: 814 566-0002
Mr. Homer Smith, PR: 814 392-3413
Mrs. Pearl Jeffries, Social Services: 814 722-5056

DIGITAL LESSON PACING GUIDE

ConnectED Instructions

Please see attached instructions for accessing the digital curriculum.

USATestPrep Instructions

Please see attached instructions for accessing this test-prep site.

If you have access to high speed internet, below are the assignments the teachers have assigned for the various content areas:

Digital Pacing Guide

	Monday	Tuesday	Wednesday	Thursday	Friday
ELA/Writing 7th and 8th grade	Connect Ed-Re-Read 2 "It's Not Fair" Complete: Vocab, Read, Using Language and Access 1 activity	Use Khanacademy.org Complete the first assignment-Key Ideas/Realistic Fiction "The Steep Climb"	Connect Ed-Point of View Complete: Define, Vocab, Model Practice and Access 1 activity	Use Khanacademy.org Complete the second assignment-Key Ideas/Creative Fiction "Close Encounter"	Catch up day-Work on anything that is incomplete.
Math	USA Test Prep	USA Test Prep	USA Test Prep	USA Test Prep	USA Test Prep
Science	Complete USA Test assignments	Complete USA Test assignments	Complete USA Test assignments	Complete USA Test assignments	Complete USA Test assignments
Social Studies	Connect Ed-"Monday April 6-Wednesday April 8"	Connect Ed-"Monday April 6-Wednesday April 8"	Connect Ed-"Monday April 6-Wednesday April 8"	USA Test Prep-"April 9th-Alimahmoodi"	USA Test Prep-"Friday April 10th-Alimahmoodi"

ELA PRINT MATERIAL

Mrs. Norgard

Monday 4/6 Read "Lexington" Complete the activities at the bottom.
Tuesday 4/7 Read "My Job" Complete the activities at the bottom.
Wednesday 4/8 Read "My New President" Complete the activities at the bottom.
Thursday 4/9 Read "My Sister, the Soldier" Complete the activities at the bottom.
Friday 4/10 Read "Potawatomi Prairie" Complete the activities at the bottom.

If you have any questions, you can reach me at knorgard@erieriseacademy.org or on my cell phone at (910) 988-7997. Missing you!!

MATH PRINT MATERIALS

GRAYSON-WAYNE
Math

3 Printed Material - USATest Prep worksheets

- **3 worksheets**

Chapter 6 Packets

- **1-2 lessons per day**

Coach PSSA Packets on Probability and Statistics

- **1-2 lessons per day**

8148449220 Texts only please

Daily Class Dojo Check-Ins

- **please provide contact information if you haven't already.**

*****Please complete atleast 2 lessons per day and work on USATest Prep daily. Contact me for questions**

SCIENCE/SOCIAL STUDIES PRINT MATERIAL

Social Studies-Alimahmoodi:

*The packet provided is arranged in the order that it is to be completed.

Chapter 18: Civilizations of Korea, Japan, and Southeast Asia

Day 1 (Monday 4/6)

1. Complete the end of unit Assessment
    a. Please use all materials you have used and completed up until now to assist you.

Day 2 (Tuesday 4/7)

1. Read the article "First Ladies of the World"
2. Answer the questions that follow

Day 3 (Wednesday 4/8)

1. Read the article "Cherokee in the United States"
2. Answer the questions that follow

Day 4 (Thursday 4/9)

1. Read the article "The Astronaut Wives Club"
2. Answer the questions that follow

Day 5 (Friday 4/10)

1. Read the article "California"
2. Answer the questions that follow

Monday- Intro to viruses

Tuesday- Bacteriophages

Wednesday- Animal & human viruses

Thursday- Evolution of viruses

Friday- Read and learn how to protect yourself from Coronavirus disease

Wordsearch-Extra points

ADDITIONAL RESOURCES (EDUCATIONAL)

Included are a list of hand selected resources for students with internet to use at home.

Khan Academy
USA Test Prep
Connect Ed
Study Sync

8th Grade Science Lesson Plan/Worksheet for April 5-9 (Ecology)

Directions-Read and Understand the Lesson and the Vocabulary.

Finish the homework by answering the questions at the end of the page.

Monday- Intro to viruses

Tuesday- Bacteriophages

Wednesday- Animal & human viruses

Thursday- Evolution of viruses

Friday- **Read and learn how to protect yourself from Coronavirus disease**

Wordsearch-Extra points

Monday - **Read and Understand the Lesson and the Vocabulary.**

Finish the homework by answering the questions at the end of the page.

Intro to viruses

What a virus is. The structure of a virus and how it infects a cell.
Key points:

- A **virus** is an infectious particle that reproduces by "commandeering" a host cell and using its machinery to make more viruses.
- A virus is made up of a DNA or RNA genome inside a protein shell called a **capsid**. Some viruses have an external membrane **envelope**.
- Viruses are very diverse. They come in different shapes and structures, have different kinds of genomes, and infect different hosts.
- Viruses reproduce by **infecting** their host cells and reprogramming them to become virus-making "factories."

Introduction

Scientists estimate that there are roughly 10^\text{31}103110, start superscript, start text, 31, end text, end superscript viruses at any given moment^11start superscript, 1, end superscript. That's a one with 313131 zeroes after it! If you were somehow able to wrangle up all 10^\text{31}103110, start superscript, start text, 31, end text, end superscript of these viruses and line them end-to-end, your virus column would extend nearly 200200200 light years into space. To put it another way, there are over ten million times *more* viruses on Earth than there are stars in the entire universe^22squared.

Does that mean there are 10^{31}103110, start superscript, start text, 31, end text, end superscript viruses just waiting to infect us? Actually, most of these viruses are found in oceans, where they attack bacteria and other microbes^33cubed. It may seem odd that bacteria can get a virus, but scientists think that *every* kind of living organism is probably host to at least one virus!

What is a virus?

A **virus** is a tiny, infectious particle that can reproduce only by infecting a host cell. Viruses "commandeer" the host cell and use its resources to make more viruses, basically reprogramming it to become a virus factory. Because they can't reproduce by themselves (without a host), viruses are not considered living. Nor do viruses have cells: they're very small, much smaller than the cells of living things, and are basically just packages of nucleic acid and protein.

Still, viruses have some important features in common with cell-based life. For instance, they have nucleic acid genomes based on the same genetic code that's used in your cells (and the cells of all living creatures). Also, like cell-based life, viruses have genetic variation and can evolve. So, even though they don't meet the definition of life, viruses seem to be in a "questionable" zone. (Maybe viruses are actually undead, like zombies or vampires!)

How are viruses different from bacteria?

Even though they can both make us sick, bacteria and viruses are very different at the biological level. Bacteria are small and single-celled, but

they are living organisms that do not depend on a host cell to reproduce. Because of these differences, bacterial and viral infections are treated very differently. For instance, antibiotics are only helpful against bacteria, not viruses.

Bacteria are also much bigger than viruses. The diameter of a typical virus is about 202020 - 300300300 \text{nanometers}nanometersstart text, n, a, n, o, m, e, t, e, r, s, end text (111 \text{nm}nmstart text, n, m, end text ==equals 10^\text{-9}10-910, start superscript, start text, negative, 9, end text, end superscript \text{m}mstart text, m, end text)^44start superscript, 4, end superscript. This is considerably smaller than a typical *E. coli* bacterium, which has a diameter of roughly 100010001000 \text{nm}nmstart text, n, m, end text! Tens of millions of viruses could fit on the head of a pin.
[What is the largest virus?]
1.51, point, 5\text{μm}start text, μ, m, end text0.50, point, 5\text{μm}start text, μ, m, end text^5start superscript, 5, end superscript

2020-300300\text{nm}start text, n, m, end text

The structure of a virus

There are a lot of different viruses in the world. So, viruses vary a ton in their sizes, shapes, and life cycles. If you're curious just how much, I recommend playing around with the ViralZone website. Click on a few virus names at random, and see what bizarre shapes and features you find!

Viruses do, however, have a few key features in common. These include:

- A protective protein shell, or **capsid**
- A nucleic acid genome made of DNA or RNA, tucked inside of the capsid

- A layer of membrane called the **envelope** (some but not all viruses)

Let's take a closer look at these features.

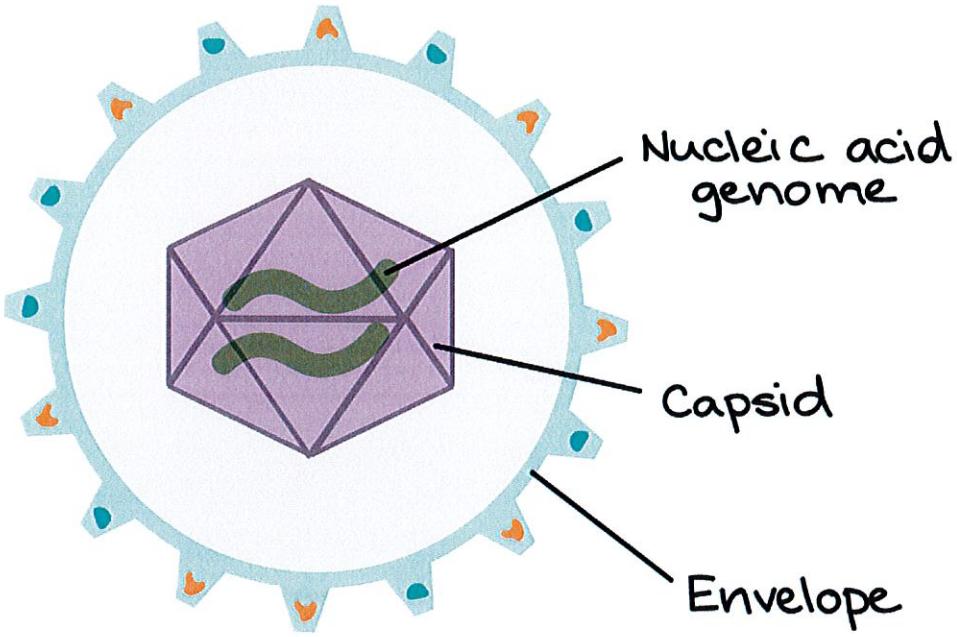
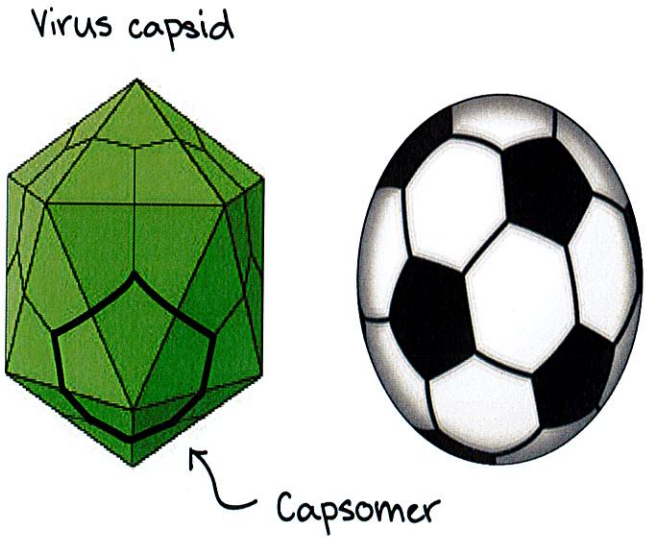


Diagram of a virus. The exterior layer is a membrane envelope. Inside the envelope is a protein capsid, which contains the nucleic acid genome.

Virus capsids

The **capsid**, or protein shell, of a virus is made up of many protein molecules (not just one big, hollow one). The proteins join to make units called **capsomers**, which together make up the capsid. Capsid proteins are always encoded by the virus genome, meaning that it's the virus (not the host cell) that provides instructions for making them.
[More about capsomers and capsids]



Comparison of a soccer ball with a virus capsid. The hexagons are one type of capsomer while the pentagon are another type. Both types of capsomer are assembled from individual virus proteins.

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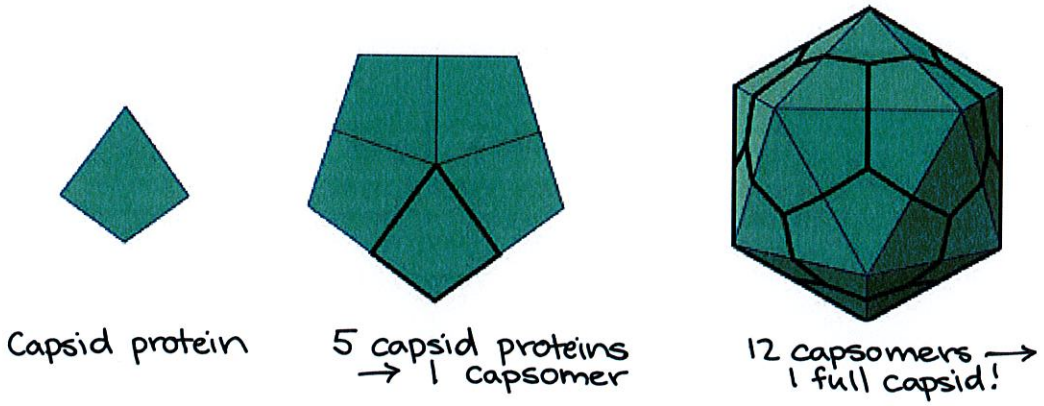


Capsid protein

5 capsid proteins = 1 capsomer

12 capsomers = one full capsid

Capsids come in many forms, but they often take one of the following shapes (or a variation of these shapes):

1. **Icosahedral** – Icosahedral capsids have twenty faces, and are named after the twenty-sided shape called an icosahedron.
2. **Filamentous** – Filamentous capsids are named after their linear, thin, thread-like appearance. They may also be called rod-shaped or helical.
3. **Head-tail** –These capsids are kind of a hybrid between the filamentous and icosahedral shapes. They basically consist of an icosahedral head attached to a filamentous tail.

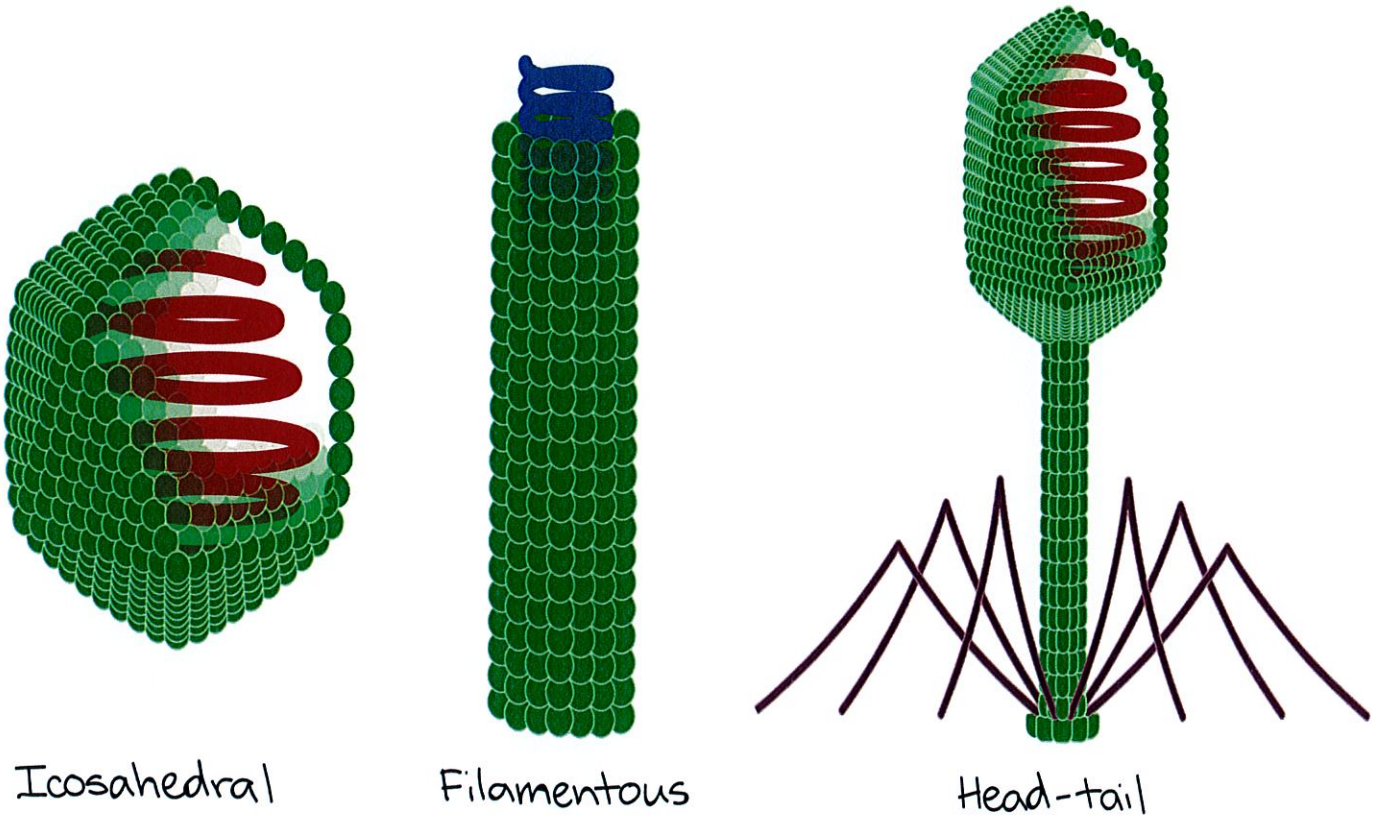


Diagram of icosahedral (roughly spherical), filamentous (rod-like), and head-tail (icosahedral head attached to filamentous tail) virus capsid shapes.

Virus envelopes

In addition to the capsid, some viruses also have an external lipid membrane known as an **envelope**, which surrounds the entire capsid.

Viruses with envelopes do not provide instructions for the envelope lipids. Instead, they "borrow" a patch from the host membranes on their way out of the cell. Envelopes do, however, contain proteins that are specified by the virus, which often help viral particles bind to host cells.

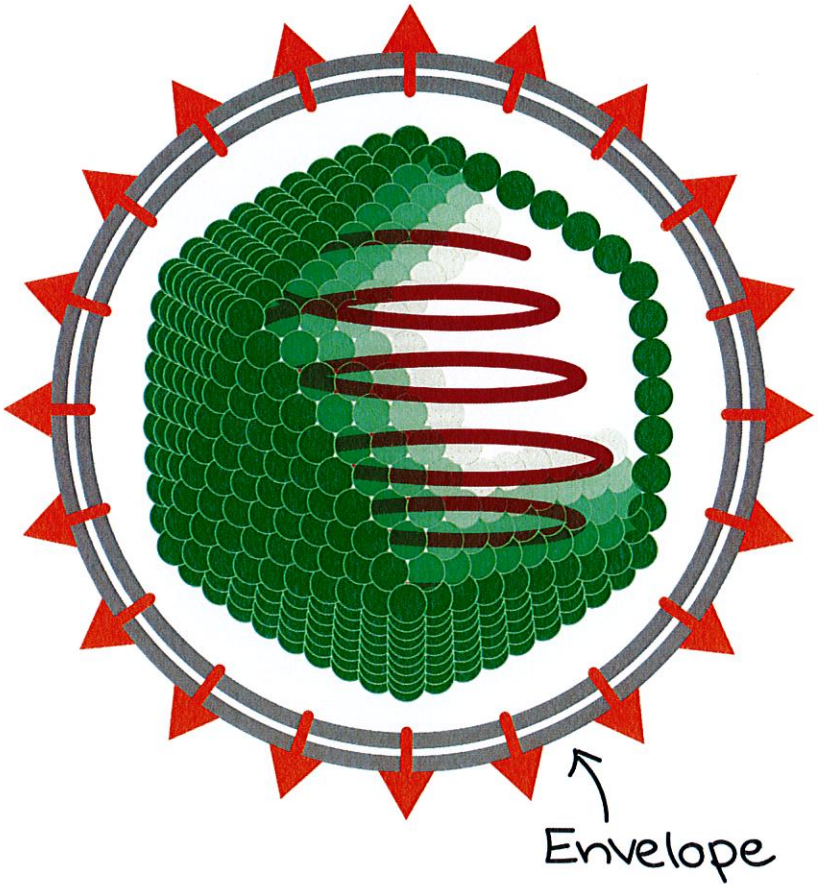


Diagram of enveloped icosahedral virus.

Although envelopes are common, especially among animal viruses, they are not found in every virus (i.e., are not a universal virus feature).

Virus genomes

All viruses have genetic material (a **genome**) made of nucleic acid. You, like all other cell-based life, use DNA as your genetic material. Viruses, on the other hand, may use either RNA or DNA, both of which are types of nucleic acid.

We often think of DNA as double-stranded and RNA as single-stranded, since that's typically the case in our own cells. However, viruses can have all possible combos of strandedness and nucleic acid type (double-stranded DNA, double-stranded RNA, single-stranded DNA, or single-stranded RNA). Viral genomes also come in various shapes, sizes, and varieties, though they are generally much smaller than the genomes of cellular organisms.
[How small?]

2,2, comma000000^6start superscript, 6, end superscript

4.64, point, 6\text{million}start text, m, i, l, l, i, o, n, end text6.66, point, 6\text{billion}start text, b, i, l, l, i, o, n, end text

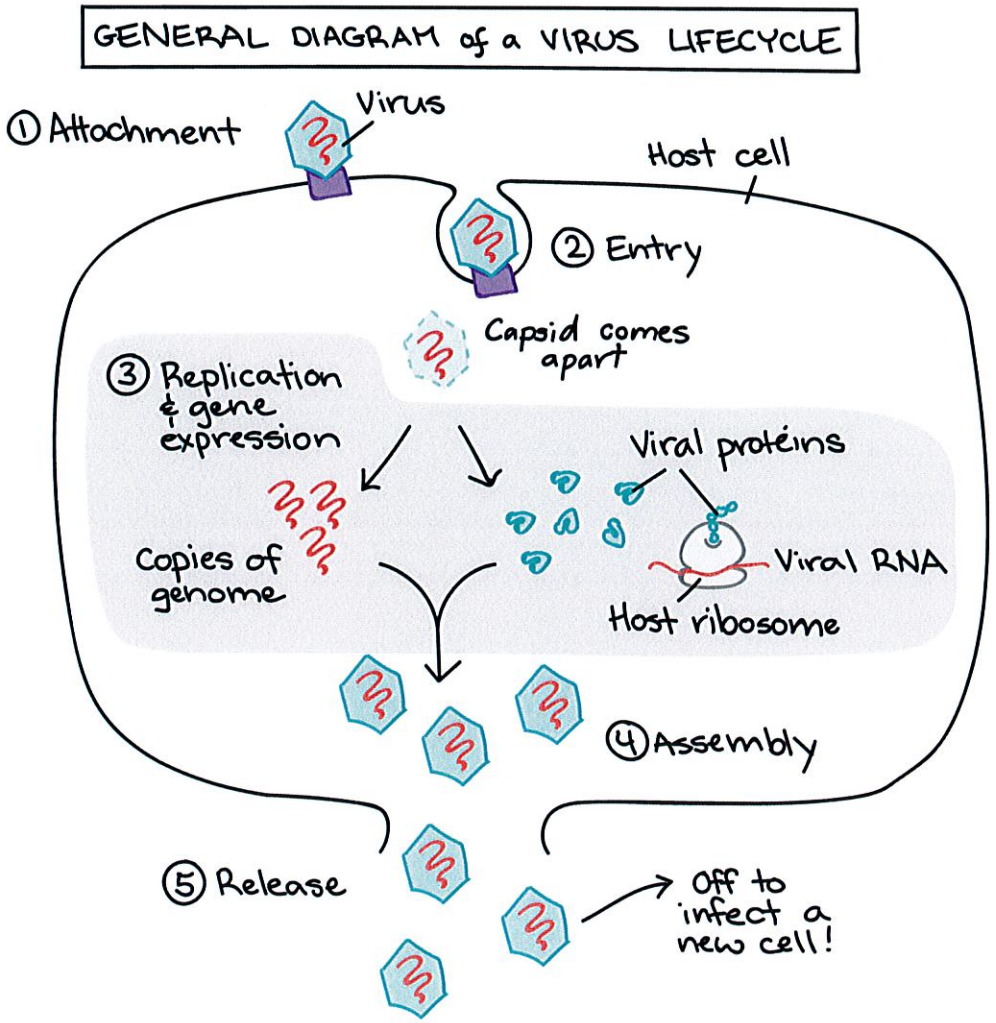
Notably, DNA and RNA viruses always use the same genetic code as living cells. If they didn't, they would have no way to reprogram their host cells!

What is a viral infection?

In everyday life, we tend to think of a viral infection as the nasty collection of symptoms we get when catch a virus, such as the flu or the chicken pox. But what's actually happening in your body when you have a virus?

At the microscopic scale, a viral infection means that many viruses are using your cells to make more copies of themselves. The viral **lifecycle** is the set of steps in which a virus recognizes and enters a host cell, "reprograms" the host by providing instructions in the form of viral DNA or RNA, and uses the host's resources to make more virus particles (the output of the viral "program").

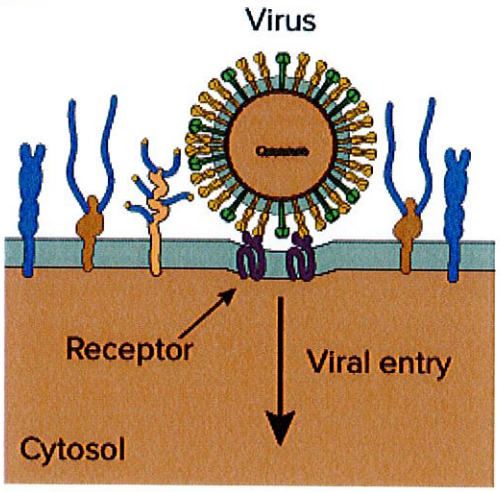
For a typical virus, the lifecycle can be divided into five broad steps (though the details of these steps will be different for each virus):



Steps of a viral infection, illustrated generically for a virus with a + sense RNA genome.

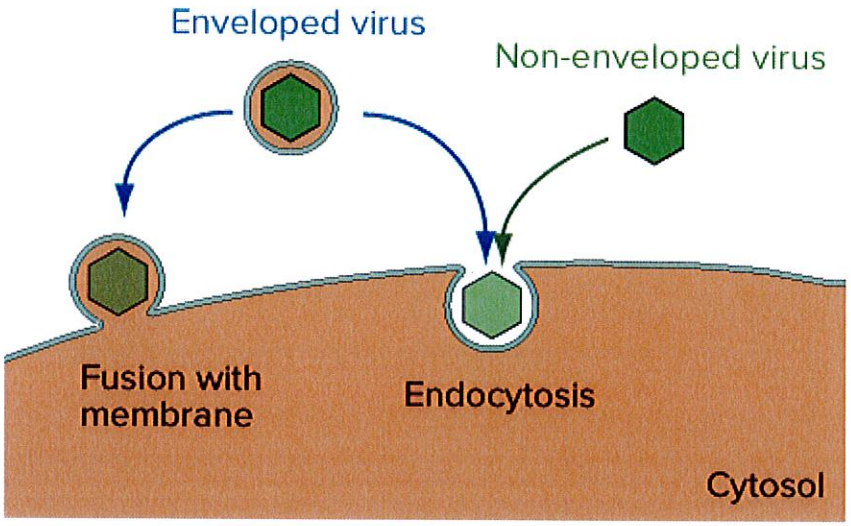
1. Attachment. Virus binds to receptor on cell surface.
2. Entry. Virus enters cell by endocytosis. In the cytoplasm, the capsid comes apart, releasing the RNA genome.
3. Replication and gene expression. The RNA genome is copied (this would be done by a viral enzyme, not shown) and translated into viral proteins using a host ribosome. The viral proteins produced include capsid proteins.
4. Assembly. Capsid proteins and RNA genomes come together to make new viral particles.
5. Release. The cell lyses (bursts), releasing the viral particles, which can then infect other host cells.

1. **Attachment.** The virus recognizes and binds to a host cell via a receptor molecule on the cell surface.
   [More about attachment]



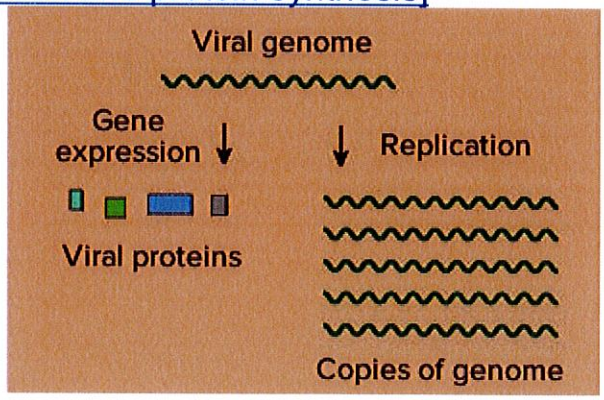
Virus binding to its receptor on the cell surface.

2. **Entry**. The virus or its genetic material enters the cell.
   [More about entry]



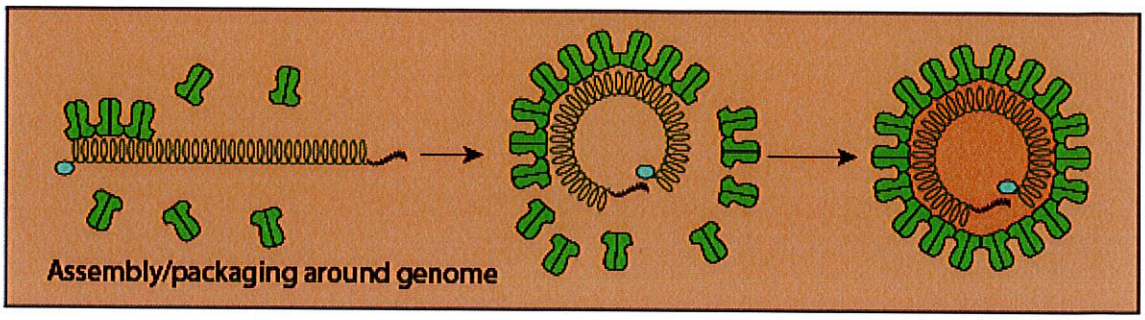
Routes of entry include endocytosis (in which the membrane folds inward to bring the virus into the cell in a bubble) and direct fusion of the viral particle with the membrane, releasing its contents into the cell.

3. **Genome replication and gene expression.** The viral genome is copied and its genes are expressed to make viral proteins.
[More about replication and protein synthesis]



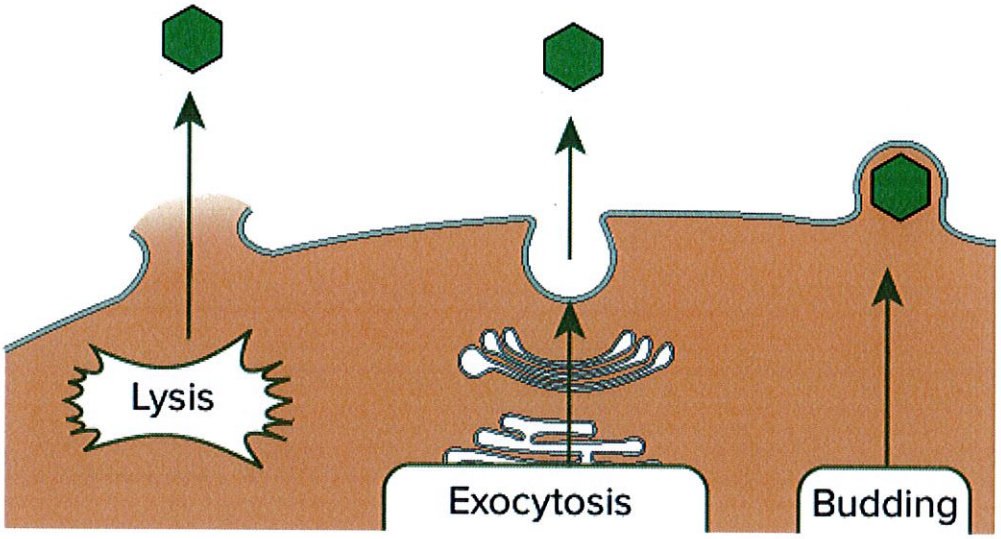
The viral genome is copied, and its genes are also expressed to make viral proteins.

4. **Assembly.** New viral particles are assembled from the genome copies and viral proteins.
[More about assembly]



Proteins of the capsid assemble around the viral genome, forming a new viral particle with the genome on the inside (encased by the capsid).

5. **Release.** Completed viral particles exit the cell and can infect other cells. [More about release]



Viruses may exit through lysis of the cell, exocytosis, or budding at the plasma membrane.

The diagram above shows how these steps might occur for a virus with a single-stranded RNA genome. You can see real examples of viral lifecycles in the articles on bacteriophages (bacteria-infecting viruses) and animal viruses.

[References]

Monday Science Homework-**Word Definition**

Name; _____
Date_____

1.virus

2.caspid

3.envelope

4.infection

5.icosahedral

6.filamentous

7.head-tail

8. viral infection

Tuesday-Read and Understand the Lesson and the Vocabulary.

Finish the homework by answering the questions at the end of the page.

Bacteriophages

Bacteria-infecting viruses. The lytic and lysogenic cycles.

Introduction

Even bacteria can get a virus! The viruses that infect bacteria are called **bacteriophages**, and certain bacteriophages have been studied in detail in the lab (making them some of the viruses we understand best).

In this articles, we'll take a look at two different cycles that bacteriophages may use to infect their bacterial hosts:

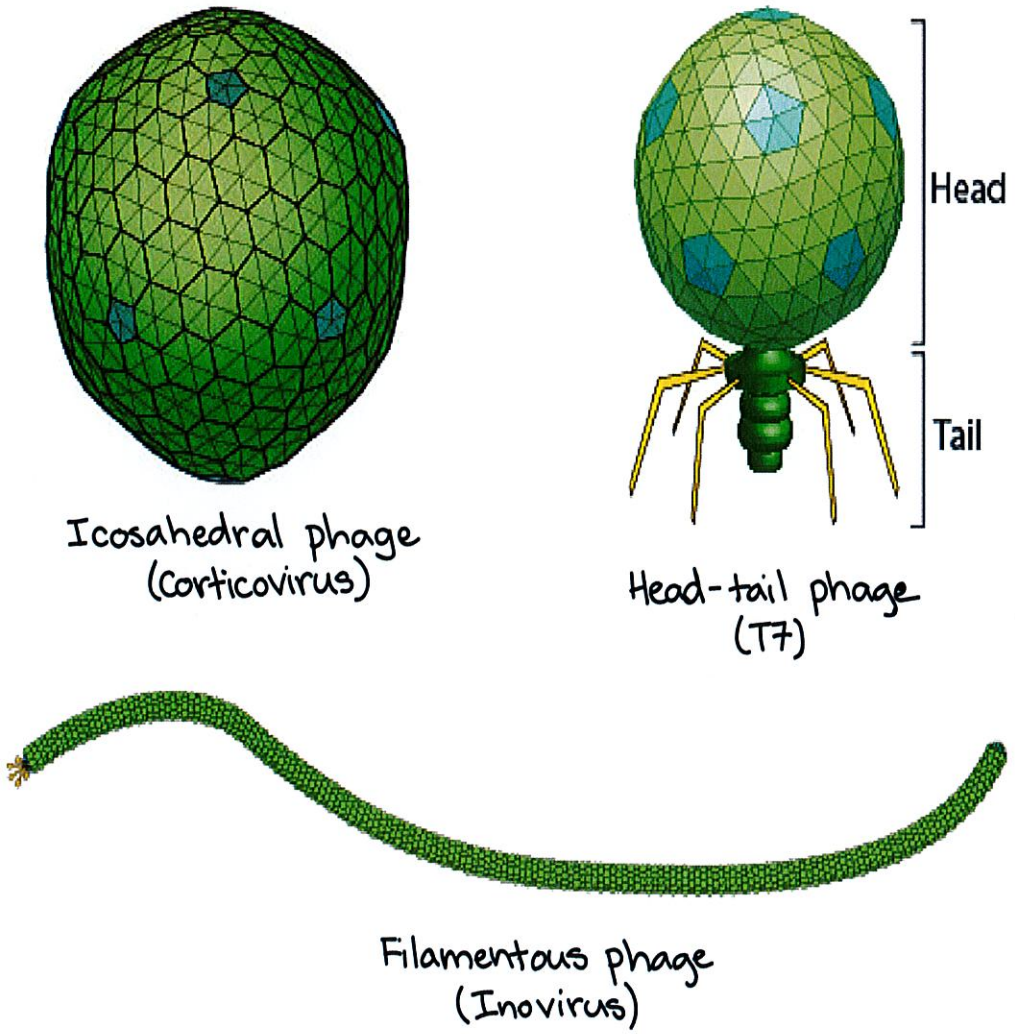
- The **lytic cycle**: The phage infects a bacterium, hijacks the bacterium to make lots of phages, and then kills the cell by making it explode (*lyse*).
- The **lysogenic cycle**: The phage infects a bacterium and inserts its DNA into the bacterial chromosome, allowing the phage DNA (now called a **prophage**) to be copied and passed on along with the cell's own DNA.

Let's take a closer look at each of these cycles.

A bacteriophage is a virus that infects bacteria

A **bacteriophage**, or **phage** for short, is a virus that infects bacteria. Like other types of viruses, bacteriophages vary a lot in their shape and genetic material.

- Phage genomes can consist of either DNA or RNA, and can contain as few as four genes or as many as several hundred^{1,2,3}1,2,3start superscript, 1, comma, 2, comma, 3, end superscript.
- The capsid of a bacteriophage can be icosahedral, filamentous, or head-tail in shape. The head-tail structure seems to be unique to phages and their close relatives (and is not found in eukaryotic viruses)^{4,5}4,5start superscript, 4, comma, 5, end superscript.



Icosahedral phage, head-tail phage, and filamentous phage.

Bacteriophage infections

Bacteriophages, just like other viruses, must infect a host cell in order to reproduce. The steps that make up the infection process are collectively called the **lifecycle** of the phage.

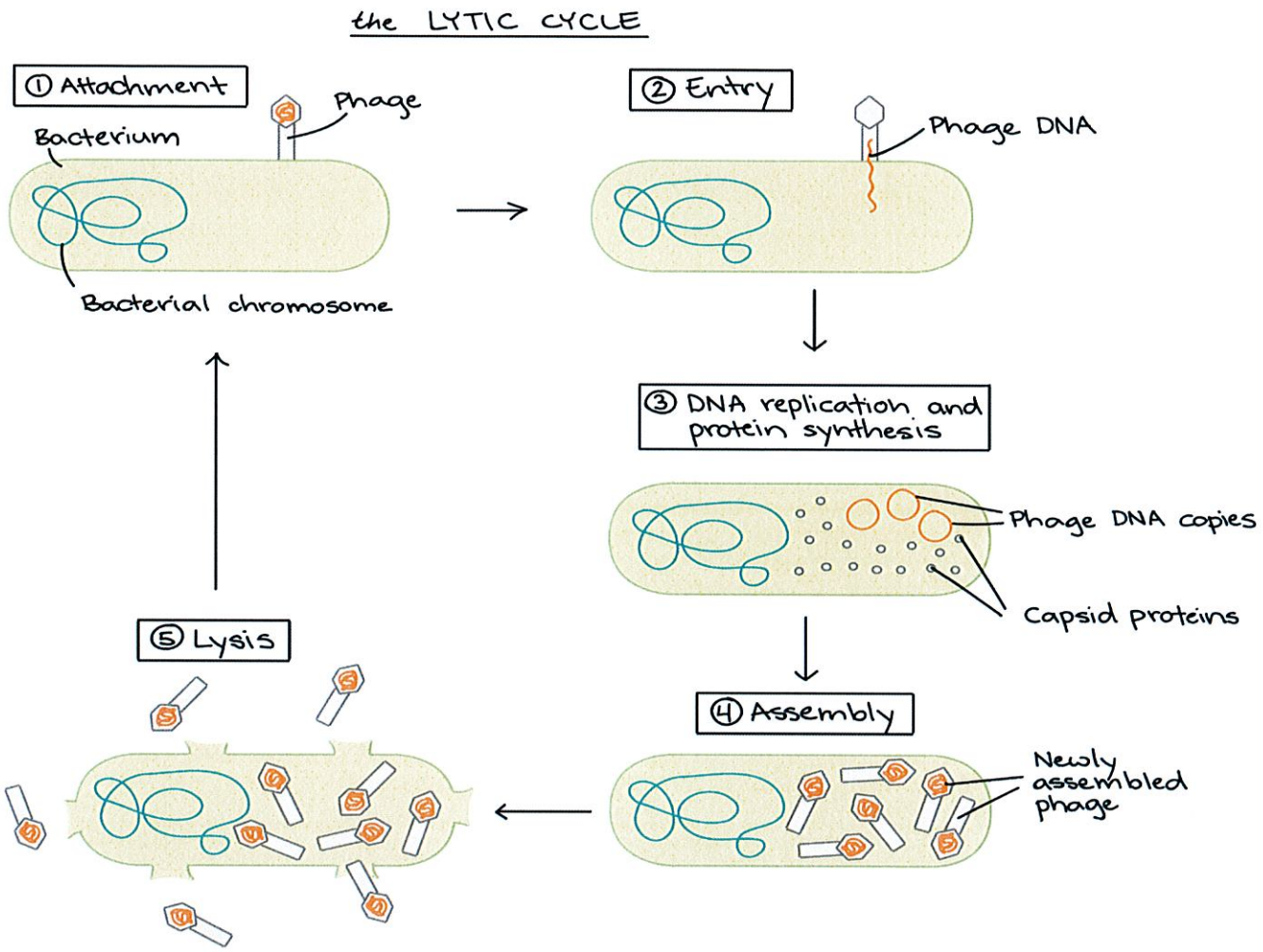
Some phages can only reproduce via a lytic lifecycle, in which they burst and kill their host cells. Other phages can alternate between a lytic lifecycle

and a lysogenic lifecycle, in which they don't kill the host cell (and are instead copied along with the host DNA each time the cell divides).

Let's take closer look at these two cycles. As an example, we'll use a phage called lambda (\lambdaλlambda), which infects *E. coli* bacteria and can switch between the lytic and lysogenic cycles.

Lytic cycle

In the **lytic cycle**, a phage acts like a typical virus: it hijacks its host cell and uses the cell's resources to make lots of new phages, causing the cell to **lyse** (burst) and die in the process.



1. **Attachment**: Proteins in the "tail" of the phage bind to a specific receptor (in this case, a sugar transporter) on the surface of the bacterial cell.
2. **Entry**: The phage injects its double-stranded DNA genome into the cytoplasm of the bacterium.
3. **DNA copying and protein synthesis**: Phage DNA is copied, and phage genes are expressed to make proteins, such as capsid proteins.
4. **Assembly of new phage**: Capsids assemble from the capsid proteins and are stuffed with DNA to make lots of new phage particles.

5. **Lysis**: Late in the lytic cycle, the phage expresses genes for proteins that poke holes in the plasma membrane and cell wall. The holes let water flow in, making the cell expand and burst like an overfilled water balloon.

Cell bursting, or **lysis**, releases hundreds of new phages, which can find and infect other host cells nearby.

The stages of the lytic cycle are:

1. **Attachment**: Proteins in the "tail" of the phage bind to a specific receptor (in this case, a sugar transporter) on the surface of the bacterial cell.
2. **Entry**: The phage injects its double-stranded DNA genome into the cytoplasm of the bacterium.
3. **DNA copying and protein synthesis**: Phage DNA is copied, and phage genes are expressed to make proteins, such as capsid proteins.
4. **Assembly of new phage**: Capsids assemble from the capsid proteins and are stuffed with DNA to make lots of new phage particles.
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   Cell bursting, or **lysis**, releases hundreds of new phages, which can find and infect other host cells nearby. In this way, a few cycles of lytic infection can let the phage spread like wildfire through a bacterial population.

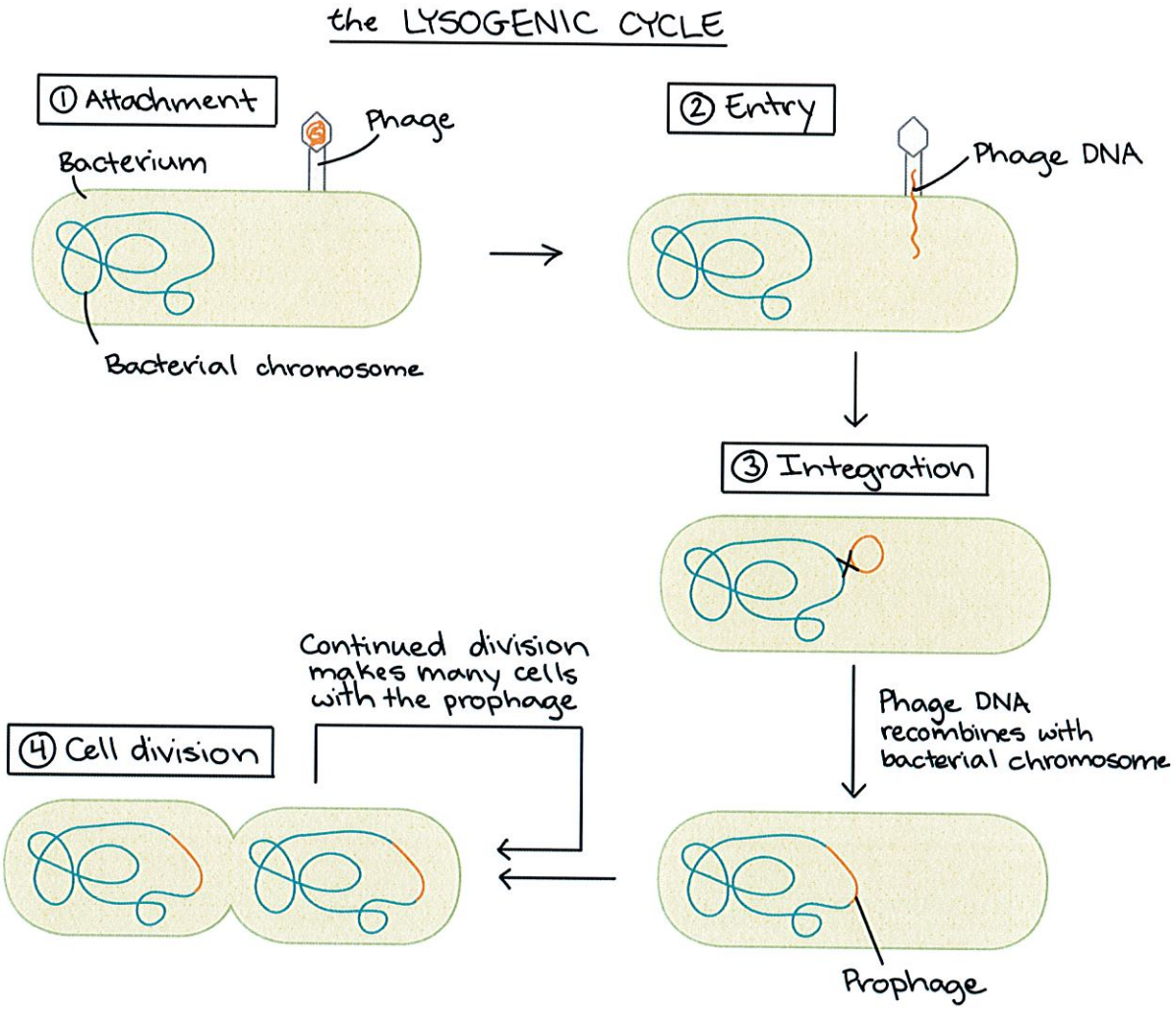
Lysogenic cycle

The **lysogenic cycle** allows a phage to reproduce without killing its host. Some phages can only use the lytic cycle, but the phage we are following, lambda (\lambdaλlambda), can switch between the two cycles.
[Do all phages use one of these two strategies?]

^{7,8}start superscript, 7, comma, 8, end superscript

In the lysogenic cycle, the first two steps (attachment and DNA injection) occur just as they do for the lytic cycle. However, once the phage DNA is inside the cell, it is not immediately copied or expressed to make proteins. Instead, it recombines with a particular region of the bacterial chromosome. This causes the phage DNA to be integrated into the chromosome.
[Is this true of all phages?]

^7start superscript, 7, end superscript

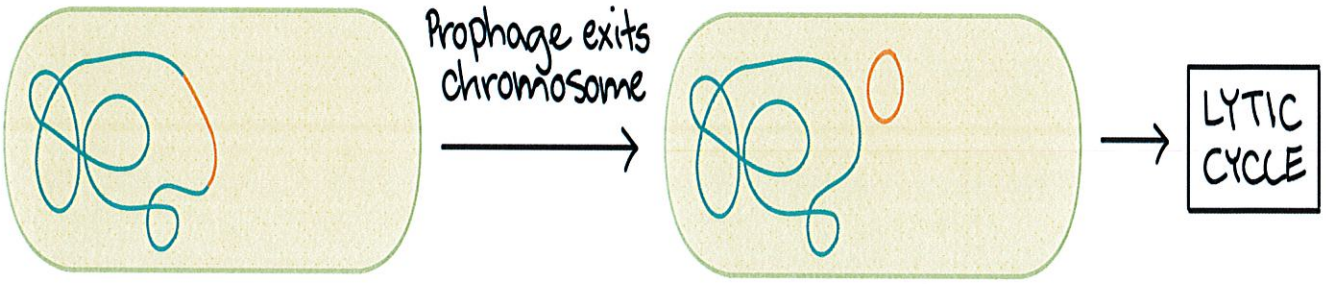


Lysogenic cycle:

1. Attachment. Bacteriophage attaches to bacterial cell.
2. Entry. Bacteriophage injects DNA into bacterial cell.
3. Integration. Phage DNA recombines with bacterial chromosome and becomes integrated into the chromosome as a prophage.
4. Cell division. Each time a cell containing a prophage divides, its daughter cells inherit the prophage.

The integrated phage DNA, called a **prophage**, is not active: its genes aren't expressed, and it doesn't drive production of new phages. However, each time a host cell divides, the prophage is copied along with the host DNA, getting a free ride. The lysogenic cycle is less flashy (and less gory) than the lytic cycle, but at the end of the day, it's just another way for the phage to reproduce.

Under the right conditions, the prophage can become active and come back out of the bacterial chromosome, triggering the remaining steps of the lytic cycle (DNA copying and protein synthesis, phage assembly, and lysis).



1. Prophage exits chromosome and becomes its own circularized DNA molecule.
2. Lytic cycle commences.

To lyse or not to lyse?

How does a phage "decide" whether to enter the lytic or lysogenic cycle when it infects a bacterium? One important factor is the number of phages infecting the cell at once^99start superscript, 9, end superscript. Larger numbers of co-infecting phages make it more likely that the infection will use the lysogenic cycle. This strategy may help prevent the phages from

wiping out their bacterial hosts (by toning down the attack if the phage-to-host ratio gets too high)^{10}10start superscript, 10, end superscript. [More explanation]

^3cubed

^4start superscript, 4, end superscript

What triggers a prophage to pop back out of the chromosome and enter the lytic cycle? At least in the laboratory, DNA-damaging agents (like UV radiation and chemicals) will trigger most prophages in a population to re-activate. However, a small fraction of the prophages in a population spontaneously "go lytic" even without these external cues^{7,11}7,11start superscript, 7, comma, 11, end superscript.

Bacteriophage vs. antibiotics

Before antibiotics were discovered, there was considerable research on bacteriophages as a treatment for human bacterial diseases. Bacteriophages attack only their host bacteria, not human cells, so they are potentially good candidates to treat bacterial diseases in humans.

After antibiotics were discovered, the phage approach was largely abandoned in many parts of the world (particularly English-speaking countries). However, phages continued to be used for medical purposes in a number of countries, including Russia, Georgia, and Poland, where they remain in use today^{12,13}12,13start superscript, 12, comma, 13, end superscript.

There is increasing interest in bringing back the "phage approach" elsewhere, as antibiotic-resistant bacteria become more and more of a problem. Research is still needed to see how safe and effective phages

are, but who knows? One day, your doctor might write you a prescription for phages instead of penicillin!

Tuesday Science Homework-**Answer the Questions?**

Name; _____ Date_____

1.Why the antibiotic kills only viruses?

2. If it's true that 8 percent of our genome were from viruses that merged with our eukaryotic ancestors, could that viral DNA be the seed for cancer in all of us?

3. **When a phage injects its double stranded DNA to a host does it still remain a phage or does it still have some other DNA strands to qualify being a phage?**

4. **Which cycle replicates the virus** faster **and which one is more** dangerous**?**

5. What potential dangers could phages even have? Will it accidentally evolve and target human cells

Read and Understand the Lesson and the Vocabulary.

Finish the homework by answering the questions at the end of the page.

Animal & human viruses

Viruses of humans and other animals. The Baltimore classification. HIV life cycle.

Key points:

- There are many different kinds of viruses that infect humans and other animals, some causing serious illness and others not.
- Viruses can be classified according to the **Baltimore system**, and human-infecting viruses fall into all of its seven categories.
- The **human immunodeficiency virus** (**HIV**), which causes **acquired immune deficiency syndrome** (**AIDS**), is a **retrovirus**.

Introduction

Have you ever had the flu or the chicken pox? If so, then you've had a close encounter of the viral kind! Whether you dream of one day finding a cure for AIDS or simply hope to avoid this year's flu bug, you're probably familiar with the suffering that can be caused by viral infections (and minimized by vaccines and treatments).

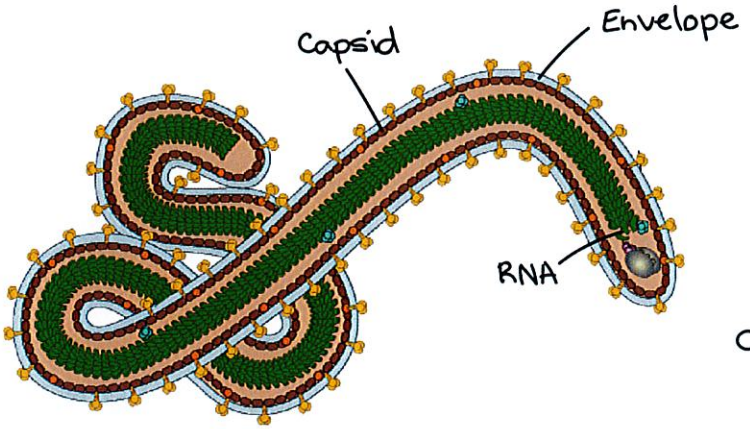
Human viruses come in many types and have a wide range of effects. Some make us sick for a day or two before going away, while others are lifelong. Some are a minor annoyance, while others, such as Ebola, can cause life-threatening complications.

Because of their impact on our health and quality of life, many human viruses (and related animal viruses) have been studied in detail. Let's take a look at some of these viruses.

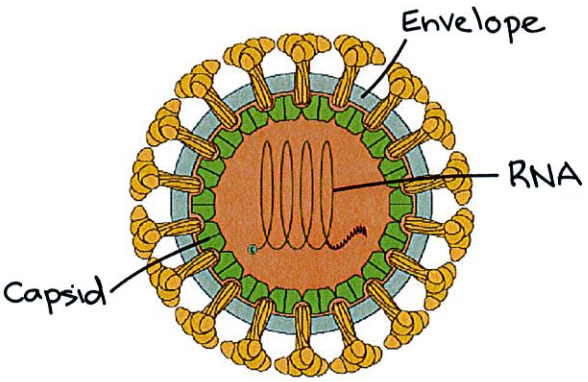
What does an animal virus look like?

Like other viruses, animal viruses are tiny packages of protein and nucleic acid. They have a protein shell, or **capsid**, and genetic material made of DNA or RNA that's tucked inside the caspid. They may also feature an **envelope**, a sphere of membrane made of lipid.

Animal virus capsids come in many shapes. One of the craziest-looking (to me, at least) is the Ebola virus, which has a long, thread-like structure that loops back on itself. A more "standard-looking" virus, chikungunya, is shown below for comparison: chikungunya looks like a sphere, but is actually a 202020-sided icosahedron.



Ebola virus particle (filamentous)



Chikungunya virus particle (icosahedral)

Animal virus genomes consist of either RNA or DNA, which may be single-stranded or double-stranded. Animal viruses may use a range of strategies (including some surprising and bizarre ones) to copy and use their genetic material, as we'll see in sections below.

How do animal viruses infect cells?

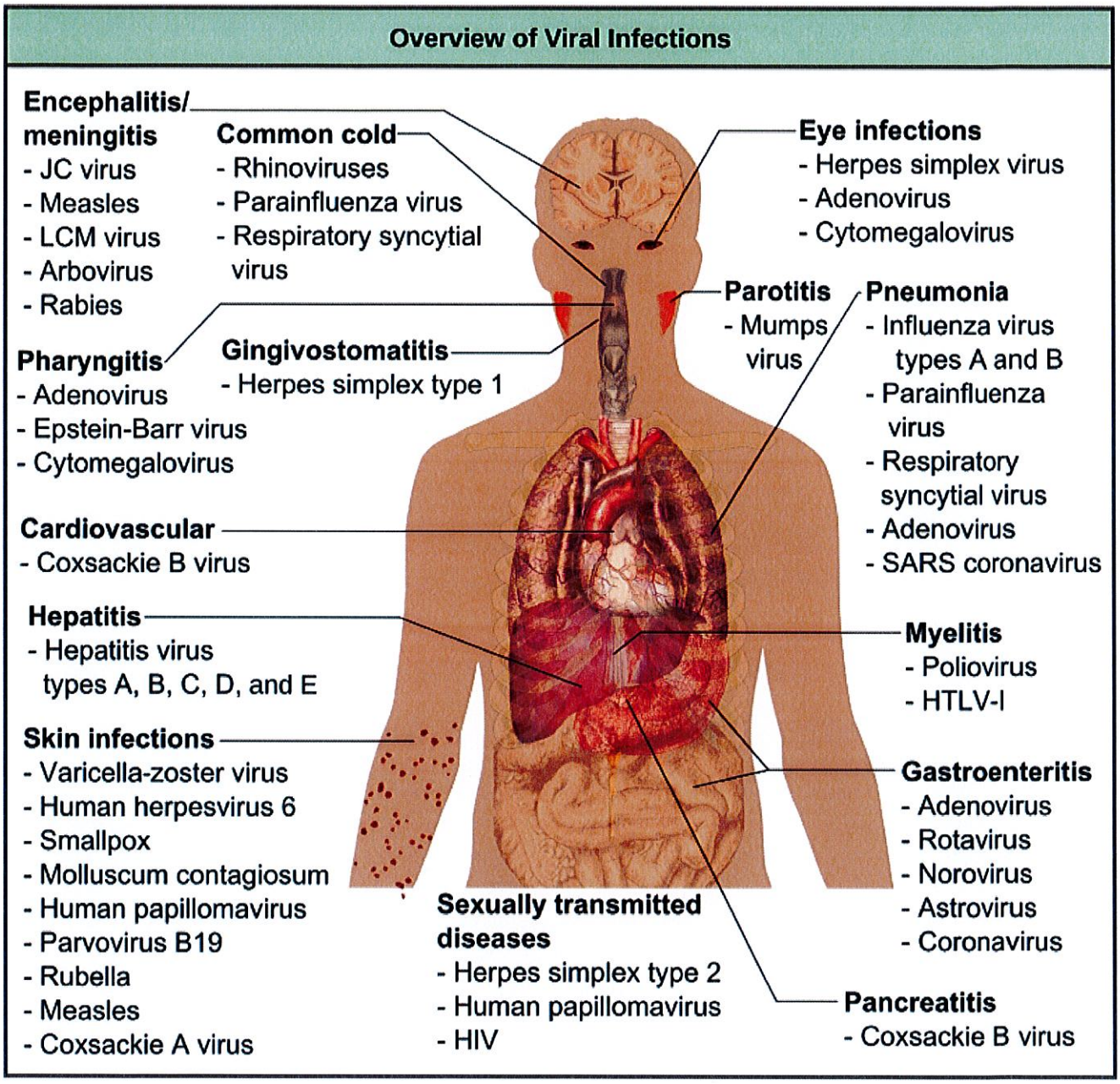
Animal viruses, like other viruses, depend on host cells to complete their life cycle. In order to reproduce, a virus must infect a host cell and reprogram it to make more virus particles.

The first key step in infection is recognition: an animal virus has special surface molecules that let it bind to receptors on the host cell membrane. Once attached to a host cell, animal viruses may enter in a variety of ways: by endocytosis, where the membrane folds in; by making channels in the host membrane (through which DNA or RNA can be injected); or, for enveloped viruses, by fusing with the membrane and releasing the capsid inside of the cell.

After the virus uses the host cell's resources to make new viral proteins and genetic material, viral particles assemble and prepare to exit the cell. Enveloped animal viruses may bud from the cell membrane as they form, taking a piece of the plasma membrane or internal membranes in the process. In contrast, non-enveloped virus particles, such as rhinoviruses, typically build up in infected cells until the cell bursts and/or dies and the particles are released.

Consequences of an infection

Viruses are associated with a variety of human diseases. The diagram below shows some common examples of viral infections that affect different systems of the human body:



The illustration shows an overview of human viral diseases. Viruses that cause encephalitis or meningitis, or inflammation of the brain and surrounding tissues, include measles, arbovirus, rabies, JC virus, and LCM virus. The common cold is caused by rhinovirus, parainfluenza virus, and respiratory syncytial virus. Eye infections are caused by herpesvirus, adenovirus, and cytomegalovirus. Pharyngitis, or inflammation of the

pharynx, is caused by adenovirus, Epstein-Barr virus, and cytomegalovirus. Parotitis, or inflammation of the parotid glands, is caused by mumps virus. Gingivostomatitis, or inflammation of the oral mucosa, is caused by herpes simplex type I virus. Pneumonia is caused by influenza virus types A and B, parainfluenza virus, respiratory syncytial virus, adenovirus, and SARS coronavirus. Cardiovascular problems are caused by coxsackie B virus. Hepatitis is caused by hepatitis virus types A, B, C, D, and E. Myelitis is caused by poliovirus and HTLV-1. Skin infections are caused by varicella-zoster virus, human herpesvirus 6, smallpox, molluscum contagiosum, human papillomavirus, parvovirus B19, rubella, measles, and coxsackie A virus. Gastroenteritis, or digestive disease, is caused by adenovirus, rotavirus, norovirus, astrovirus, and coronavirus. Sexually transmitted diseases are caused by herpes simplex type 2, human papillomavirus, and HIV. Pancreatitis B is caused by coxsackie B virus.

Some viral infections follow the classic pattern of **acute disease**: symptoms worsen for a short period, but in most cases, the virus is cleared from the body by the immune system and the patient recovers. Examples include the common cold and influenza.

Other viruses, such as the hepatitis C virus, cause long-term **chronic infections**. Still other viruses, such as human herpesviruses 6 and 7, which in some cases cause the minor childhood disease roseola, may form productive infections (ones where new viral particles are produced) without causing any symptoms at all in the host. In these cases, patients are said to have an **asymptomatic infection**.

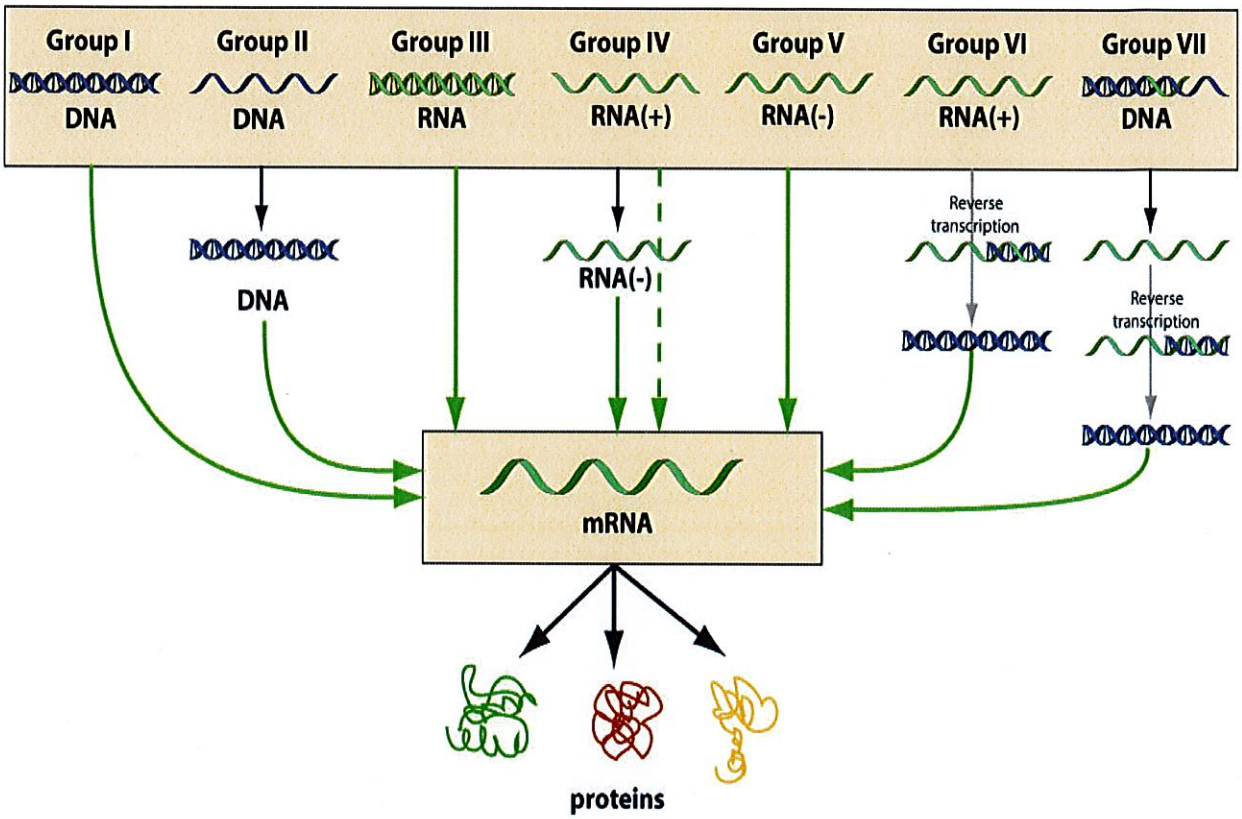
Classifying animal viruses

Animal viruses come in many types, and they enter, commandeer, and exit cells in a variety of different ways. How can we organize this mess of viruses in a way that's consistent and makes sense?

The **Baltimore system** groups viruses according to their type of genetic material and how it's used to make messenger RNAs (mRNAs), key intermediates in the production of viral proteins and the assembly of new viruses. A virus's Baltimore group depends on:

- The molecule it uses as genetic material (DNA or RNA)
- Whether the genetic material is single- or double-stranded
- The steps the virus uses to make an mRNA

The Baltimore system divides viruses into seven groups. You can see the basic features of each group, including its genetic material and the pathway it uses to make an mRNA, in the diagram below:



Green arrow = synthesis of an mRNA; dotted green arrow = direct use of the viral genome as an mRNA. Image modified from "The Baltimore classification clusters viruses into families depending on their type of genome, by ViralZone/Swiss Institute of Bioinformatics, CC BY-NC 4.0.

[What do RNA(+) and RNA(-) mean in the diagram?]

-
-

Human viruses are found in all seven Baltimore groups, while plant and bacterial viruses are found only in a subset of groups.^11start superscript, 1, end superscript If we want to develop a drug to target a virus, it's important for us to know the details of its life cycle—including its Baltimore group and other aspects of its biology—in order to block that cycle effectively.

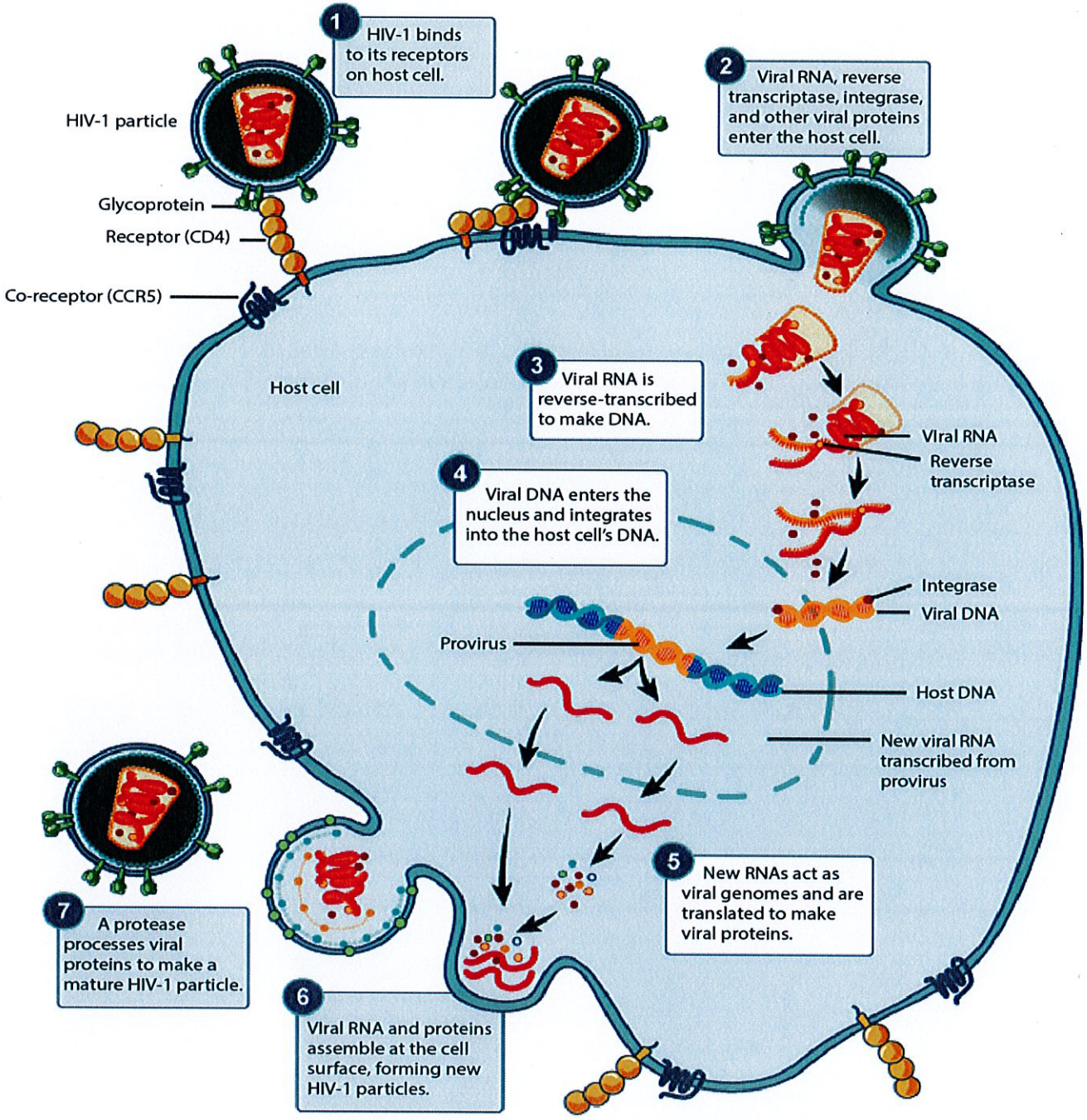
The retrovirus HIV-1

Retroviruses, found in Baltimore group VI, have a unique and fascinating life cycle. They are of special importance because **human immunodeficiency virus** (**HIV**), the virus that causes **acquired immune deficiency syndrome**, or **AIDS**, is a retrovirus.

A retrovirus genome is single-stranded RNA and comes in two copies per viral particle. The RNA must be converted into double-stranded DNA by an enzyme called **reverse transcriptase**, reversing the normal flow of information from DNA to RNA to protein in cells.

The double-stranded DNA enters the nucleus of the host cell and is inserted into the host genome by an enzyme called **integrase**. mRNA can then be made by transcription of the viral DNA, which, as a permanent part of the host cell's genome, is called a **provirus**. The mRNA is read to produce viral proteins and may also serve as a genome for new viral particles that assemble and bud from the cell.

The diagram below shows the key life cycle stages of the HIV-1 virus, the strain responsible for most cases of HIV infection.^22squared



Anti-HIV drugs inhibit viral replication at many different phases of the HIV cycle. These drugs include:

- Fusion inhibitors, which block fusion of the HIV viral envelope with the plasma membrane of the host cell

- Reverse transcriptase inhibitors, which impair the conversion of the RNA genome into double-stranded DNA
- Integrase inhibitors, which inhibit the integration of the viral DNA into the host genome
- Protease inhibitors, which block processing of viral proteins

"Cocktails" containing multiple drugs are usually most effective at slowing the progression of the infection and keeping viral levels low. You can learn why this is the case in the virus evolution article.

For more on symptoms, treatment, and prevention of HIV and AIDS, please see the Health & Medicine section on HIV and AIDS(Opens in a new window).

Wednesday Science Homework-**Answer the Questions?**

Name; _____
Date_____

1. Where does a virus gets it RNA or DNA from in the first place?

2. Why would viruses ever use RNA(-) if all it does is provide extra work to turn it into RNA(+)?

3. Where do prions fit in the virus/bacteria/etc. classification?

4. How does the viral genetic code know what to do once inside a cell?

5. What the difference between eukaryotes and prokaryotes?

6. If a cat gets a disease and passes it onto a human can the human then pass this same disease to a dog?

Thursday- Read and Understand the Lesson and the Vocabulary.

Finish the homework by answering the questions at the end of the page.

Evolution of viruses

Key points:

- Viruses undergo evolution and natural selection, just like cell-based life, and most of them evolve rapidly.
- When two viruses infect a cell at the same time, they may swap genetic material to make new, "mixed" viruses with unique properties. For example, flu strains can arise this way.
- RNA viruses have high mutation rates that allow especially fast evolution. An example is the evolution of drug resistance in HIV.

Introduction

Have you ever wondered why a different strain of flu virus comes around every year? Or how HIV, the virus that causes AIDS, can become drug-resistant?

The short answer to these questions is that viruses **evolve**. That is, the "gene pool" of a virus population can change over time. In some cases, the viruses in a population—such as all the flu viruses in a geographical region, or all the different HIV particles in a patient's body—may evolve by **natural selection**. Heritable traits that help a virus reproduce (such as high

infectivity for influenza, or drug resistance for HIV) will tend to get more and more common in the virus population over time.

[Quick review: What is evolution?]

Not only do viruses evolve, but they also tend to evolve faster than their hosts, such as humans. That makes virus evolution an important topic—not just for biologists who study viruses, but also for doctors, nurses, and public health workers, as well as anyone who might be exposed to a virus. (Hint: that means all of us!)

Variation in viruses

Natural selection can only happen when it has the right starting material: genetic variation. **Genetic variation** means there are some genetic (heritable) differences in a population. In viruses, variation comes from two main sources^11start superscript, 1, end superscript:

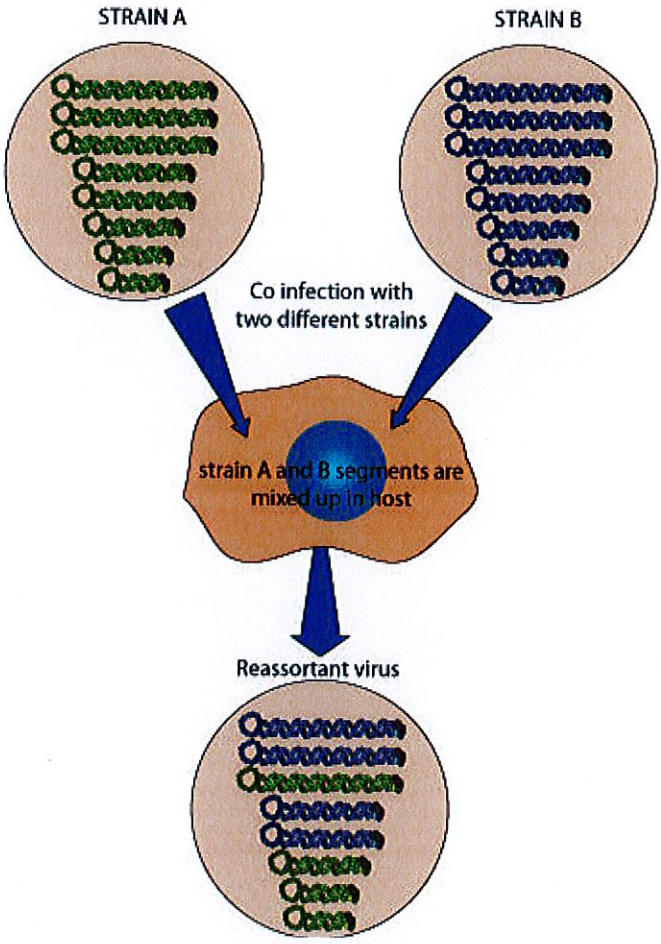
- **Recombination**: viruses swap chunks of genetic material (DNA or RNA). [What are DNA and RNA?]
- Random **mutation**: a change occurs in the DNA or RNA sequence of a virus.

We can see variation and evolution of viruses all around us if we know where to look—for instance, in the new flu strains that appear each year.

Mixing it up: Recombination

Before we look specifically at the flu, let's examine how viruses swap DNA and RNA in a process called **recombination**.

Recombination usually happens when two viruses have infected the same cell at the same time. Since both viruses are using the cell to crank out more virus particles, there will be lots of virus parts – including newly made genomes – floating around in the cell at once.



Reassortment between two viral strains that infect the same cell.

Strain A has eight segments of genetic material. Strain B also has eight segments, which bear similar genes but in different versions.

Both strains co-infect the same host cell. The segments get mixed up in the host cell.

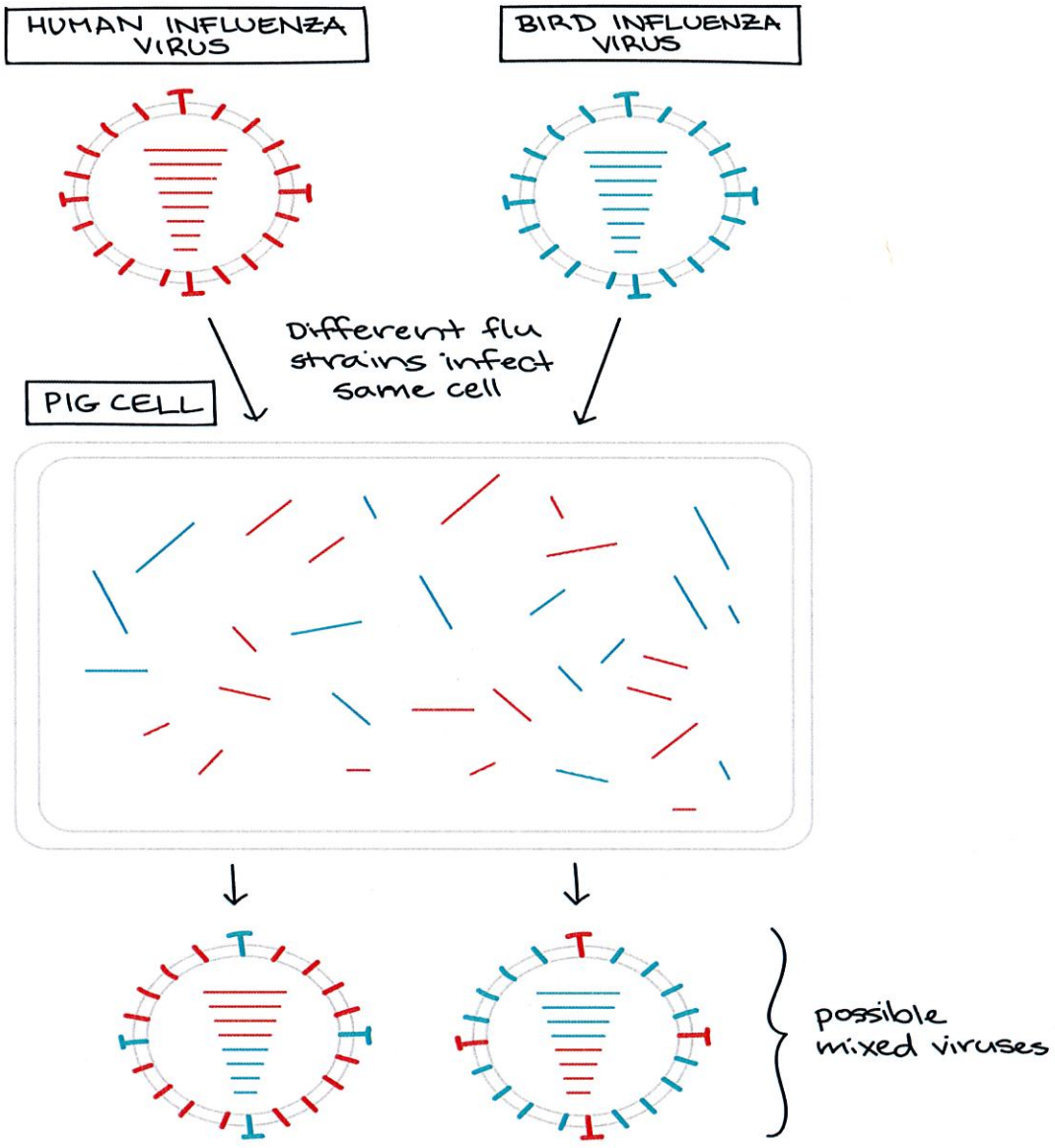
This results in the production of a reassortant virus. The reassortant virus has segments 3, 6, 7, and 8 from strain A and segments 1, 2, 4, and 5 from strain B.

Under these circumstances, recombination can happen in two different ways. First, similar regions of viral genomes can pair up and exchange pieces, physically breaking and re-connecting the DNA or RNA. Second, viruses with different segments (kind of like tiny chromosomes) can swap some of those segments, a process called reassortment. ^{2,3}2,3start superscript, 2, comma, 3, end superscript

Recombination and influenza ("the flu")

Influenza ("flu") viruses are masters of reassortment. They have eight RNA segments, each carrying one or a few genes.^{4}4start superscript, 4, end superscript

When two influenza viruses infect the same cell at the same time, some of the new viruses made inside of the cell may have a mix of segments (e.g., segments 1-4 from strain A and segments 5-8 from strain B).



Human influenza virus and bird influenza virus infect same pig cell. Each has eight segments of RNA in its genome.

The segments get mixed up as new viruses are made in the cell.

Various different combinations could be made. For example, we could get one virus particle with segments 1-4 from the human virus and segments 5-8 from the other, and vice versa.

Pigs in particular are well-known "mixing vessels" for influenza viruses.^{5}5start superscript, 5, end superscript Pig cells can be recognized, and thus infected, by both human and bird influenza viruses (as well as pig viruses).^{6}6start superscript, 6, end superscript If a cell in the pig is infected with two types of virus at the same time, it may release new viruses that contain a mixture of genetic material from the human and bird viruses.

This kind of swap is common for influenza viruses in nature. For example, remember the H1N1 influenza strain ("swine flu") that caused a pandemic in 2009? H1N1 had RNA segment from human and bird viruses, as well as pig viruses from both North America and Asia. This combo reflects a series of reassortments that occurred step by step over many years to produce this H1N1 strain.^{5,7}5,7start superscript, 5, comma, 7, end superscript

Viral mutations

We've seen how recombination can affect virus evolution, but what about mutation? A **mutation** is a permanent change in the genetic material (DNA or RNA) of a virus. A mutation can happen if there is a mistake during copying of the DNA or RNA of the virus.

Some viruses have very high mutation rates, but this is not universally the case. In general, RNA viruses tend to have high mutation rates, while DNA viruses tend to have low mutation rates.^88start superscript, 8, end superscript

Why is this the case? The key difference lies in the copying machinery. Most DNA viruses copy their genetic material using enzymes from the host cell, called DNA polymerases, which “proofread" (catch and fix mistakes as

they go). RNA viruses instead use enzymes called RNA polymerases, which don't proofread and thus make many more mistakes.^99start superscript, 9, end superscript

Case study: HIV drug resistance

Human immunodeficiency virus (**HIV**) is the virus that causes **acquired immune deficiency syndrome** (**AIDS**). HIV is an RNA virus with a high mutation rate and evolves rapidly, leading to the emergence of drug-resistant strains.

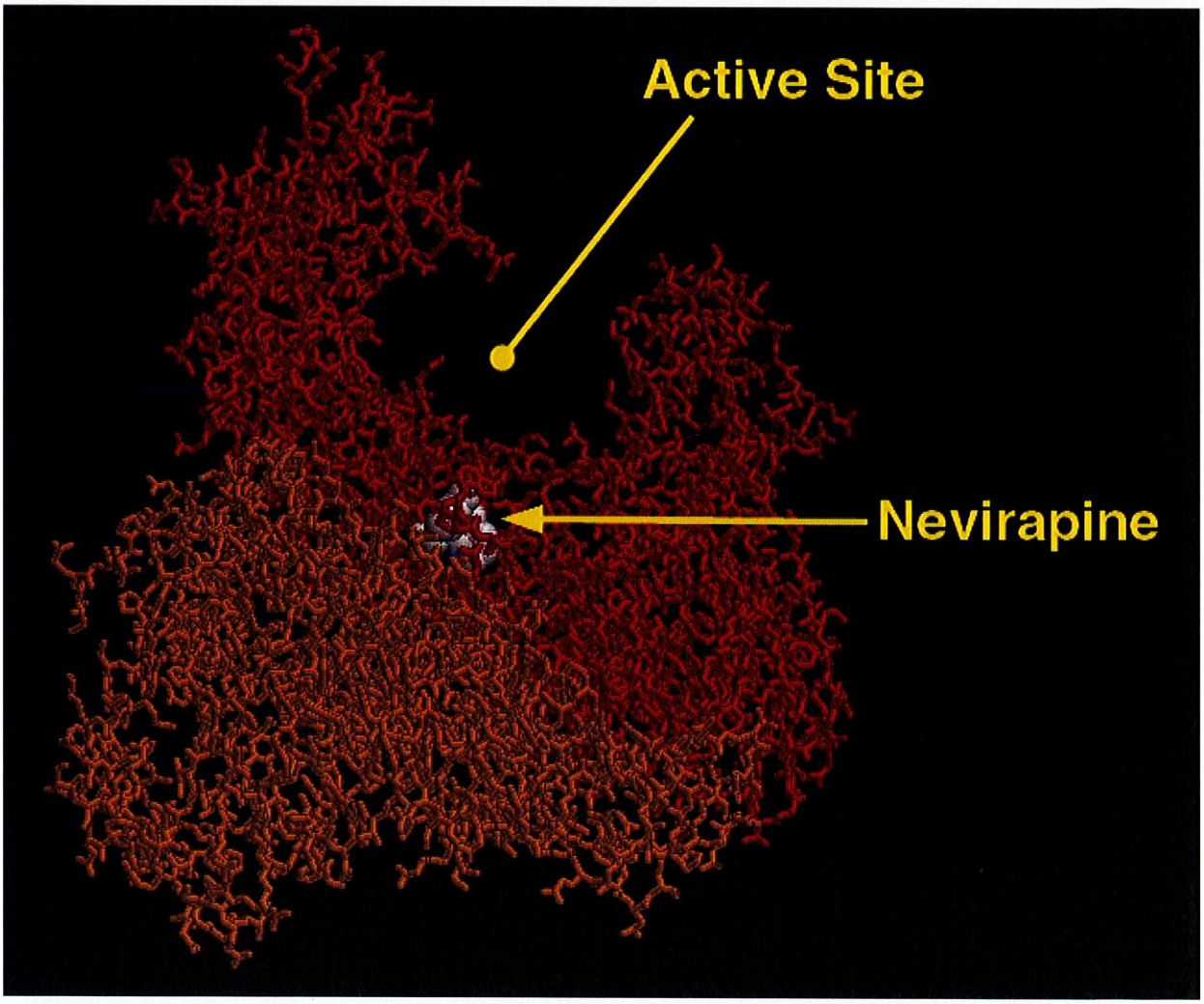
HIV's high mutation rate

Because RNA viruses like HIV have a high mutation rate, there will be lots of genetic variation in the population of HIV viruses in a patient's body. Many of the mutations will be harmful, and the mutant viruses will simply "die" (fail to reproduce). However, some mutations help viruses reproduce under specific conditions. For instance, a mutation may provide resistance to a drug.^{10}10start superscript, 10, end superscript

Evolution of drug resistance in HIV

Certain drugs can block the replication of HIV by inhibiting key viral enzymes. Taking one of these drugs will at first reduce a patient's viral levels. After awhile, however, the HIV viruses typically "bounce back" and return to high levels, even though the drug is still present. In other words, a drug-resistant form of the virus emerges.^{10}10start superscript, 10, end superscript

To see why this took place, let's use the example of a specific type of antiviral drug, a reverse transcriptase inhibitor. Reverse transcriptase inhibitors, like the nevirapine molecule shown in the diagram below, bind to a viral enzyme called reverse transcriptase (the red-and-brown structure). The drug keeps the enzyme from doing its job of copying the RNA genome of HIV into DNA. If this enzyme is inactive, an HIV virus can't permanently infect a cell.^{11}11start superscript, 11, end superscript



Ball-and-stick molecular model of HIV reverse transcriptase enzyme with the reverse transcriptase molecule nevirapine bound to it.

Image modified from "Exploring the structure," by David S. Goodsell, RCSB PDB Molecule of the Month, CC BY 4.0.

Most HIV viruses are stopped by nevirapine. However, a very small fraction of the viruses in the HIV population will (by random chance) have a mutation in the gene for reverse transcriptase that makes them resistant to the drug. For instance, they might have a genetic change that alters the drug's binding site on the enzyme, so that the drug is no longer able to latch on and inhibit enzyme activity.

The viruses with this resistance mutation will reproduce despite the presence of the drug and, over generations, can re-establish the viral levels present before the drug was administered. Not only that, but the entire virus population will now be resistant to the drug!

HAART drug resistance

If HIV can evolve its way around a drug, how can the virus be stopped? What seems to work best is a combination approach, with three or more drugs taken at the same time. This approach to treatment is called **highly active antiretroviral therapy**, or **HAART** for short. The drugs given in a HAART "cocktail" typically target different parts of the HIV lifecycle.^{12,13}12,13start superscript, 12, comma, 13, end superscript

The HAART approach works because it's relatively unlikely that any one HIV virus in a population will happen to have three mutations that give resistance to all three drugs at the same time. Although multi-drug-resistant forms of the virus do eventually evolve, multi-drug combinations considerably slow the evolution of resistance.^{10}10start superscript, 10, end superscript

To learn more about the biology of HIV, please see the article on virus lifecycles. To learn more about symptoms, treatment, and prevention of HIV and AIDS, please see the Health & Medicine section on HIV and AIDS.

Why do viruses evolve so fast?

Viruses evolve faster than humans. Why is this the case?

As we saw in the case of HIV, some viruses have a high mutation rate, which helps them evolve quickly by providing more variation as starting material. Two other factors that contribute to the fast evolution of viruses are large population size and rapid lifecycle.^{14}14start superscript, 14, end superscript

The bigger the population, the higher the odds that it'll have a virus with a particular random mutation (e.g., one for drug resistance or high infectivity) on which natural selection can act. Also, viruses reproduce quickly, so their populations evolve on shorter timescales than those of their hosts. For instance, the HIV virus goes through its lifecycle in just 525252 hours, as compared to roughly 202020 years for the human lifecycle!^{15}15start superscript, 15, end superscript

What tools do we have to combat fast-evolving viruses? Taking steps to prevent transmission, identifying new drugs for treatment, and developing and using vaccines are all important strategies.

Thursday Science Homework- Answer the Questions?
Name; _____ Date_____

1. How does the influenza virus affect the human body?

2. What would happen if 3 viruses combined?

3. How does the virus affect human population?

4. What does RNA mean?

5. Does nuclear energy affect the arrangement of DNA or RNA arrangement in the cell of virus which can also lead to evolution?

6. Could we prevent viruses besides using meds or certain things?

7. Do virus have excretion?

Friday- Read and learn how to protect yourself from Coronavirus disease

People may be sick with the virus for 1 to 14 days before developing symptoms. The most common symptoms of coronavirus disease (COVID-19) are fever, tiredness, and dry cough. Most people (about 80%) recover from the disease without needing special treatment.
More rarely, the disease can be serious and even fatal. Older people, and people with other medical conditions (such as asthma, diabetes, or heart disease), may be more vulnerable to becoming severely ill.

People may experience:

Cough ,fever, tiredness, difficulty breathing (severe cases)

DO THE FIVE

Help stop coronavirus

1

HANDSWash them often

2

ELBOWCough into it

3

FACEDon't touch it

4

SPACEKeep safe distance

5

HOMEStay if you can

There is no specific medicine to prevent or treat coronavirus disease (COVID-19). People may need supportive care to help them breathe.
Self care
If you have mild symptoms, stay at home until you've recovered. You can relieve your symptoms if you:
rest and sleep
keep warm
drink plenty of liquids
use a room humidifier or take a hot shower to help ease a sore throat and cough

Medical treatments

If you develop a fever, cough, and have difficulty breathing, promptly seek medical care. Call in advance and tell your health provider of any recent travel or recent contact with travelers.

Viruses, Bacteria, Protists and Fungi

E N D O S P O R E A I O A R
P E H A S I S O I B M Y S P
R V A O A D I R F T N R V R
O I L O S E E O E U N R A O
T R G Y E T I V B T N P C T
O U A A I L I C E I B G C I
Z S E P N E H C I L A U I S
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D E N O I T C U D O R P E R
M S I L A U T U M A I U M H
I G O N U R E A A B A G B P
B A C T E R I O P H A G E T

VIRUS
BACTERIA
PARASITE
BUDDING
CILIA
REPRODUCTION
FUNGI
SYMBIOSIS
BACTERIOPHAGE
ENDOSPORE
PROTIST
VACCINE
HYPHAE
MUTUALISM
ALGAE
PROTOZOAN
LICHEN
HOST

WAR ON SUPERBUGS

B V D K D A P N O S I K H R D X M J B A
O C T A Y R E P A I R O S E C I Z J X B
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R K D B U R S Q E N H P P F M P S M J H
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B B B T S Q H G U B R E P U S B T W I G
O D Y J C T O R V L W H W P U Z O N N N
E M K P J Y F W F Y O C O R O O M B A A
P P Z N F H X C B F V C D E L H F M Q B
J J T G L X W J T T D H V I R U S H H L

ANTIBIOTIC
BATTLE
BIOLOGY
CHOLERA
DERAIL
DIARRHEA
DISEASE
ENGINEER
GENE
HOSPITALIST
INFECTION
INVADER
MIRACLE
MOLD
PATIENT
PENICILLIN
PHAGE
PLEDGE
POSTER
PRESCRIBE
REPAIR
RESISTANCE
SCOURGE
SHOPPER
SPREAD
SULFA DRUGS
SUPERBUG
SYMPTOM
TOXIC
TUBERCULOSIS
VIRUS
YOGURT

Lexington

CCSSR1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
Includes questions you can ask about any story.
Story Source: Public Domain, adapted by Center for Urban Education

I remember it vividly. We were fighting for our freedom. There was a battle at Lexington, and the news of Lexington spread everywhere, producing wild excitement. My father and I got ready to join the new army. It was as if the world was different that day. Everyone would go to Boston to join the army. Imagine you were there.

Every village and every farmhouse helped to swell the number. Men came from all over, even from tiny towns. In Connecticut, an old man was plowing his field and proclaimed, "This is my fight, too." He unyoked his oxen, left his plow in the furrow, and, leaping to his saddle, raced to join the army. Just picture what that was like.

Fiery Ethan Allen, at the head of his Green Mountain Boys, was eager to join us, but he stopped with his Green Mountain Boys to take over a fort. The soldiers did not expect them at all. Despite the fact that the Green Mountain Boys had not fought before, they were extremely brave, and the British gave up without a fight.

Day by day the army grew, until thirty thousand men were encamped around Boston, from Charlestown Neck to Dorchester. We were all terribly excited and determined. I was afraid, too, but I decided that I needed to remain strong and brave. Just imagine what it was like then.

The patriot leaders were beginning to grow impatient. It was now the middle of June, and they had decided the time had finally come to fight. They chose a place for the battle; the location selected was the highland on the Charlestown peninsula known as Bunker Hill. They chose the date of June 16th. How do you think we felt?

The battle of Bunker Hill was a great fight. Never in my life had I witnessed such bravery on behalf of so many men. No one gave up, everyone fought hard, and we all worked together. Although it was a struggle, we remained strong. I really believe that with that one battle, our nation was born. We all felt different after the battle of Bunker Hill. We were Americans. I hope you can experience the feelings that I felt then.

I can recall that great battle clearly, and I remember the ones after that as well. Although it took much longer than I had initially anticipated, it was well worth it. It was difficult, and I became exhausted, but then we won and freed our country. We were a new nation. Now, each year on the fourth of July, I remember those days and smile. I hope you do, too.

Write your answers to these questions on another page.

1. Sequence: Which event happened first? Which happened last?
2. Character Traits: Name one character. What is one trait you infer that character has? Explain why you think that.
3. Motive: What is something that person does? Why do you think that person does that?
4. Summarize: Summarize the story in four sentences. Tell about the characters and what they do.
5. Main Idea: What do you think is the main idea of the story? Why?

Cherokee in the United States

by ReadWorks

William Penn Adair, Cherokee delegate to U.S. Congress, 1866

A very long time ago, before the United States even existed, the land was already home to a wide variety of different American Indian tribes. You may have also heard people belonging to these tribes called "Indian" and "Native American." While some people may think of American Indians as one group of people who are all similar to one other, there are actually big differences between the American Indian ethnic groups and the tribes formed within them. Each of the different ethnic groups has a unique culture and language, and each tribe has its own system of government. Each tribe also has a unique history of interaction with early European settlers and the United States.

One example of an American Indian ethnic group is the Cherokee. Within this group, the Cherokee people formed tribes, or communities whose members shared a language, customs, and beliefs. Currently, there are three "federally recognized" Cherokee tribes in the United States, which means they get special programs and services from the government, and also have certain legal rights. In addition to these three recognized tribes, there are more than 200 other groups who identify themselves as Cherokee tribes.

The Cherokee originally lived in what we now know as the southeastern United States. This includes modern-day Georgia, North Carolina, South Carolina, and Tennessee. They lived by farming, hunting, and gathering on the land. In the 1700s, they first started to interact with the Europeans. The Cherokee traded deerskins with the Europeans, and the two groups generally had a good relationship with each other. However, as more European settlers began to move onto land the Cherokee needed for hunting or gathering, the Europeans and the Cherokee came into conflict. This led to many battles, and the Cherokee lost a lot of land to the Europeans. After the American Revolution, the Cherokee lost even more of their land as the Americans began to build new settlements in Cherokee territory.

Over the next few decades, the Cherokee people started to change. As they spent more time with the Americans, they started to adopt some parts of American culture and technology. For example, Cherokee tribes used to grow their food on communal farms. This means that the entire tribe shared the same land, farming it together and sharing the crops among themselves. The Americans encouraged them to switch to growing their food on individual farmsteads. This practice is similar to what we think of as farming today. Each farmer owns a piece of land, and grows his or her own crops on it. They also raised pigs and cattle on the land instead of hunting deer. The new United States government also gave the Cherokee spinning wheels and taught them how to spin cotton. In the 1800s, the Cherokee even began to adopt some of the structures of the United States government for their own society. They even had their own Constitution!

However, as the United States grew, the government wanted more land for new settlers. This led to the government and army pushing Cherokee off their land. At first, some of the Cherokee voluntarily relocated, but a lot of them were forced to move even though they didn't want to. In the 1830s, in an infamous event known as the Trail of Tears, the United States Army forced the Cherokee to march to Oklahoma. More than 4,000 Cherokee died during this march.

Today, most Cherokee live in Oklahoma, North Carolina, or on the West Coast. In the decades following the Trail of Tears and forced removal of the Cherokee, the United States government has worked hard to improve its relationship with the Cherokee and other American Indian groups. The government passed laws to let some tribes maintain their own governments and govern themselves legally within the United States. The Cherokee Nation is the largest federally recognized Cherokee tribe, and it has more than 300,000 members today.

Name: _____ Date: _____

1. When did the Cherokee people first start to interact with Europeans?

A. the 1500s

B. the 1600s

C. the 1700s

D. the 1800s

2. What does this passage describe?

A. This passage describes the historical background of the Cherokee in the United States.

B. This passage describes the different tribes of American Indians, including the Cherokee.

C. This passage describes the different places that the Cherokee have lived.

D. This passage describes how the Cherokee farm their land.

3. The Cherokee were not always treated fairly by the United States government. What evidence from the passage supports this statement?

A. "The Americans encouraged [the Cherokee] to switch to growing their food on individual farmsteads."

B. "[A]s the United States grew, the government . . . and army push[ed] the Cherokee off their land."

C. "The Cherokee Nation is the largest federally recognized Cherokee tribe, and it has more than 300,000 members today."

D. "In the 1800s, the Cherokee even began to adopt some of the structures of the United States government for their own society."

4. What has been the main reason for conflict between the Cherokee and the United States?

A. The United States wanted the land on which the Cherokee lived.

B. The Cherokee live in tribes, while most people in the United States do not.

C. The Cherokee adopted some parts of American culture and technology.

D. Americans farmed differently than the Cherokee.

5. What is the main idea of this text?

A. Since the Trail of Tears, the United States has worked hard to improve its relationship with the Cherokee.

B. After interacting with Americans, Cherokee farmers began raising their own crops, pigs, and cattle.

C. The governments of Cherokee tribes are very different from the government of the United States of America.

D. The Cherokee's relationship with the United States government has changed with their interactions.

6. Read these sentences from the text.

[The Cherokee] lived by farming, hunting, and gathering on the land. In the 1700s, they first started to interact with the Europeans. The Cherokee traded deerskins with the Europeans, and the two groups generally had a good relationship with each other.

Based on these sentences, what does the word "interact" mean?

A. to compete

B. to dislike

C. to come into contact

D. to teach skills

7. Choose the answer that best completes the sentence.

_____ , the Cherokee had a good relationship with early European settlers.

A. Initially

B. Instead

C. Finally

D. Obviously

8. What was the Trail of Tears?

9. How has the United States tried to improve its relationship with the Cherokee?

10. How has the relationship between the Cherokee and the United States changed over time? Support your answer with evidence from the text.

First Ladies

Three countries. Three new leaders. Three women.

Chris Hondros/Getty Images

Johnson-Sirleaf vows to unite Liberia and create jobs.

Chile, Liberia, and Germany don't seem to have much in common. The three countries lie on different continents. They do not have a shared language, currency, culture, or history.

But on closer examination, those different nations are more similar than they appear. All three nations have elected women leaders. Michelle Bachelet of Chile, Ellen Johnson-Sirleaf of Liberia, and Angela Merkel of Germany join a small but growing group of female heads of state.

Here is a look into the lives of these three powerful women and the challenges currently facing their countries.

Michelle Bachelet - Chile

When Michelle Bachelet was 23 years old, she and her mother were jailed and beaten. They had opposed a 1973 coup, or government overthrow, that brought Augusto Pinochet Ugarte to power. Pinochet was a brutal dictator who terrorized those who disagreed with him. He jailed more than 27,000 Chileans and executed more than 3,000.

Bachelet and her mother were released and exiled to Australia and Germany. In 1979, Bachelet returned to Chile and graduated from medical school. After democracy was restored in Chile in 1990, she entered public service. Bachelet served as Minister of Health and as Defense Minister. She was praised for helping to heal lingering distrust between Chilean citizens and the military. On January 15, 2006 the 54-year-old was elected President. Her term ended in March of 2010.

As Chile's first female head of state, Bachelet's priority was to bridge the gap between the rich and the poor. Chile is a wealthy nation, but the richest 20 percent of its population controls 61 percent of the country's wealth, according to the World Bank.

"Chile needs to [create] more equal opportunities so that everyone can benefit from what the country has to offer," Bachelet told reporters after her election.

Ellen Johnson-Sirleaf - Liberia

Ellen Johnson-Sirleaf is known as "Iron Lady" and "Ma Ellen." Both sides of her personality will help her in the daunting task she faces: reuniting and rebuilding Liberia following 14 years of war.

Although the bloody civil war ended a few years ago, scars still mark the African nation. Fighting left more than 200,000 people dead. Millions more were forced to flee their homes. Liberia still has no regular electricity or running water. The nation's unemployment rate is 80 percent.

Johnson-Sirleaf, a Harvard-educated economist and grandmother, has vowed to make a "fundamental break" with her country's past. "We [must] take bold and decisive steps to address the problems that for decades have stunted our progress," Johnson-Sirleaf said in her inaugural address on January 16, 2006.

Johnson-Sirleaf is Africa's first elected female head of state, but she is not new to politics. She served as Liberia's Finance Minister until 1980 and made an unsuccessful run for the presidency in 1997.

"I am excited by the potential of what I represent: the aspirations and expectations of women in Liberia, African women, and women all over the world," Johnson-Sirleaf says.

Angela Merkel - Germany

Angela Merkel is not only the first woman to serve as the Chancellor of Germany but also the first Chancellor, male or female, to have grown up in East Germany.

After World War II (1939-1945), the United States, France, and Britain divided Germany into two parts-East Germany and West Germany. As West Germany prospered as a democracy, communist East Germany remained poor. Under communism, the country had few jobs. East and West Germany were reunited in 1989.

Experts say Merkel's humble upbringing as a minister's daughter will help her understand Germany's economic problems. Back when she was elected, the European country's economy hadn't grown for more than five years, and 12.6 percent of the population was unemployed in March 2005. That unemployment rate was the highest Germany had seen since the 1930s.

When Merkel was sworn in as Chancellor on November 22, 2005, she promised to reduce unemployment. "Our aim is to stop this downward trend and reverse it," Merkel told reporters. "We want to give people hope of having jobs." The country's unemployment has since fallen to 5.6 percent.

Name: _____ **Date:** _____

1. Which three countries have chosen women to lead them?

A. Italy, France, and Liberia

B. Canada, Liberia, and Germany

C. Chile, Liberia, and Germany

D. Cuba, Liberia, and Germany

2. Read these three sentences from the passage, and answer the question below:

"Chile, Liberia, and Germany don't seem to have much in common. The three countries lie on different continents. They do not have a shared language, currency, culture, or history."

Which of the following describes the relationship of these sentences?

A. The sentences present three items in sequence.

B. One sentence gives a cause, and the others give effects.

C. The sentences describe problems and solutions.

D. The sentences compare three countries.

3. What might have best prepared the three women to lead their countries?

A. meetings with other leaders

B. trips to other countries

C. their families

D. their past experiences

4. Read this sentence from the passage:

"She was praised for helping to heal lingering distrust between Chilean citizens and the military."

Based on the text, the word lingering means

A. lasting
B. rising
C. increasing
D. growing

5. Which statement supports the main idea of the passage?

A. Three women have become leaders of their countries.
B. Three countries elected women leaders to solve major economic and social problems.
C. Chile and Liberia have serious social problems that need to be resolved.
D. Three countries have to solve major economic and social problems.

6. In which country do only a small percentage of people control most of the wealth?

7. What might help each of the leaders solve her country's economic problems? Cite information in the passage to support your answer.

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

The bloody civil war ended a few years ago, _____ scars still mark the African nation.

A. mostly

B. next

C. after

D. but

Name: _____ **Date:** _____

1. The priority of both Ellen Johnson-Sirleaf and Angela Merkel is:

A. crime.

B. healthcare.

C. unemployment.

D. education.

2. Based on the passage, what do Liberia and Germany have in common?

A. Both countries are located on the continent of Africa.

B. Both countries have been negatively affected by war.

C. People in both countries speak the same language.

D. Neither country has electricity or running water.

3. The author wrote that Bachelet has improved the "lingering distrust" between the citizens of Chile and the military." This means

A. the military is having a hard time controlling the citizens of Chile.

B. the citizens of Chile do not want to join the military.

C. the citizens of Chile still do not fully trust the military.

D. the citizens of Chile trusted the military too much.

4. The three countries, Liberia, Germany and Chile, are all

A. wealthy nations.

B. currently at war with one another.

C. on different continents.

D. experiencing low unemployment rates.

5. Do you think women lead their countries differently from the way men do? Why or why not?

The Astronaut Wives Club

by Valorie Sands

aerial view of Johnson Space Center in Houston, Texas

There are few moments as exciting as watching a manned rocket take off into space. Even more memorable were the sights and sounds of man's first steps on the moon.

Less than one-third of today's Americans were alive during the first moon landing. But history will long remember the unforgettable words Neil Armstrong spoke when he succeeded in landing the Apollo 11 on the moon. With a cool head and extraordinary skill, when he saw the lunar module was heading toward an unsafe landing area, he took over manual control and landed the lunar module with only enough fuel to keep it going for about 15 seconds. When he announced, "The Eagle has landed," people who were following the mission from earth breathed a sigh of relief.

It's easy to see why early astronauts captured the nation's love and admiration. Even though most are only dimly remembered heroes, astronauts like John Glenn, Gus Grissom, and Neil Armstrong served as shining examples of courage under pressure, mental and physical excellence, and the value of teamwork.

Many films were made about space missions, most famously The Right Stuff (1983) and Apollo 13 (1995). Books were written about the brave and brainy men who were selected for the ultimate adventure. But until recently, little has been said about the wives who waited for them back on earth. Now a new book, The Astronaut Wives Club by Lily Koppel, has changed that. Koppel's bestseller tells the stories of the strong women behind the men who pioneered space travel.

The book begins in the late 1950s, when a man's family is seen as a reflection of his work life: a good home with a pretty wife and adorable children translated into a good career. An important part of an astronaut's wife's job was to maintain the perfect image of domestic happiness. Astronaut wives were pressured by NASA, their husbands, and their own sense of duty to display an outward image of family perfection. They had to smile their way through dealing with the fears for their spouses' safety and the challenges of maintaining a home and children with almost no help. It was a difficult path, but also served as the basis for the strong friendships that grew between the women. The astronauts' wives were in it together.

The Houston suburbs where the wives made a home for their heroic husbands were called the "Spaceburbs," or sometimes "Togethersville." Along with triumph, the town was also the scene of tragedy. Seven of the first 30 astronaut wives lost their husbands during the Mercury, Gemini, and Apollo missions. After astronaut Ed White perished in a capsule blaze, his wife Pat fell into a deep depression. In an interview with the author, another astronaut wife described Mrs. White: "She just worked at being Ed's wife. She was wonderful at it. That's all."

Ms. Koppel called the wives' accounts "the emotional story of the space race." She said, "Why I was so excited about writing this book was because it really was the heart of the American space adventure." It tells a story about female friendship, about how these women comforted each other while their husbands catapulted through space.

She recalled her inspiration for writing The Astronaut Wives Club as struck-by-lightening chance. After she saw a Life magazine photo of the wives in their skyrocketing beehives and outfitted in their swirling candy-colored mini-dresses, the author turned to her husband, who is also a writer, and asked, "Has a book ever been written about the wives?" She said she had always loved The Right Stuff and Apollo 13, but never realized how much she wanted to know more about the women until seeing that picture. "When I found out they actually have a club, and that they raised their families in the Houston spaceburbs near NASA's operations, in a community known as Togethersville-the whole thing was just amazing!"

She began gathering information for the book by visiting wives scattered all across the country. Most of the women who Ms. Koppel interviewed were in their 70s and finally ready to talk freely. "They told me about their friendships with Jackie Kennedy." Meeting with the elegant First Lady was often their reward after their husbands had completed a successful mission. They talked about how unprepared they were to have the eyes of the world upon them. With constant attention from the press, "they were like America's first reality stars," Koppel said. "They all felt young and inexperienced, thrown into this role."

Joan Aldrin, wife of the second man to walk on the moon, gave the author her diary. It told the story of Buzz Aldrin's Apollo 11 world tour. It was a difficult time; her husband's life had started to spiral out-of-control. In the 1970s, their marriage ended in divorce. After enduring divorce and retiring from NASA, the former astronaut returned to studies involving space. He won several patents on space-related inventions and also founded the ShareSpace Foundation, whose stated mission is to "share the

wonders of space with children of all ages and to foster affordable space travel opportunities for all people."

"What I wanted to communicate in The Astronaut's Wives Club is that the women behind the astronauts were almost in their own crazy NASA space program. They had this equally challenging role of keeping the home fires burning bright and projecting this perfect American family image to the world," said Ms. Koppel. "These were very different, complicated women."

When asked why she thought the astronaut wives' stories were ignored for so long, she said, "The wives saw their devotion as part as their duty. They weren't outspoken; they weren't heroes. We can now take a look back and see that it wasn't just about the guys in the silver suits. There was this whole community of engineers, and there was this whole story at home. These wives were basically single mothers during the week who were mowing the lawn, keeping the checkbook balanced; making sure their husbands weren't overly stressed at home, according to NASA's recommendations."

Although being an astronaut's wife required an independent and courageous spirit, space travel strained most of their marriages. Yet most of the wives would not have traded places with anyone. "I haven't heard one person say they would do it another way," Koppel said.

Looking back, Apollo 13 astronaut Jim Lovell's wife Marilyn said, "It was the best time of my life." She recalled that the wives sacrificed as much as their husbands. "If he couldn't make it home for two or three weekends in a row because he was training, it was just part of the mission. But then there were incredible things like round-the-world tours after your husband came back, and meeting heads of State, and feeling like you were higher-than-high society and royalty. Your husband had gone where none of this international jet set could even dream of going."

While gathering information for the book, Ms. Koppel met and spoke with many of the former astronauts. All expressed appreciation for the significant role these women played in the space race. One of the astronauts said, "We could not have done it without them. We could not have landed on the moon without them."

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D. the Houston "spaceburbs" where astronauts' families lived

6. Read the following sentences: "They had to smile their way through dealing with the fears for their spouses' safety and the challenges of maintaining a home and children with almost no help. It was a difficult path, but also served as the **basis** for the strong friendships that grew between the women. The astronauts' wives were in it together."

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D. before

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The Astronaut Wives Club

by Valorie Sands

aerial view of Johnson Space Center in Houston, Texas

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California

by Michael Stahl

California is the third-largest state in America. Only Texas and Alaska have greater areas of landmass than California. However, the Golden State, as it is sometimes called, is the most populated. Over 38 million people call California home, which means about one out of every eight people in the United States of America lives there. Most Californians live in cities by the Pacific Ocean.

Perhaps the most famous region of the state of California is the southernmost section. San Diego is located there and is only about 20 miles north of Mexico. Sitting on the Pacific Ocean, San Diego has a population of 1.3 million people who get to enjoy the city's lovely climate. The nearby ocean keeps temperatures in San Diego rather steady. San Diego has a high temperature of at least 70 degrees for two-thirds of the days in a calendar year, and only 10 inches of rain on average fall there each year. San Diego's economy gets a big boost from tourism, with approximately 30 million people visiting there every year to enjoy the sunny days. Because of the favorable climate, surfing has become one of the most popular local sports.

However, Los Angeles, about a two-hour drive north, is undoubtedly a better-known city when compared to San Diego. L.A., as it is often abbreviated, is home to nearly four million people, making it the most highly populated city in California. Los Angeles only trails New York on the list of most populated cities in the entire country. Like San Diego, Los Angeles residents enjoy wonderful weather. There is a large surfing community in Los Angeles as well, but the city is best known as the center of the American film industry. Six hundred movies a year are made in Hollywood, which is located in L.A. Many historians believe the local climate is to thank for the existence of Hollywood, because it makes it easier to get more outdoor work done throughout the year. And since southern California is so

warm, many of America's finest athletes have come from that area too. They have been able to practice their sports year round in the warm southern California sun.

Another California city, San Francisco, is ranked among the most popular in the United States, but this one was settled farther north in a very different environment. San Francisco has a population of 800,000 within the city limits. Like San Diego and Los Angeles, San Francisco borders the Pacific Ocean. The city lies on a peninsula though, with the San Francisco bay on the opposite side of the ocean. The City by the Bay, as it is often labeled, is much cooler than those southern cities. One interesting fact about San Francisco is that the city features the lowest average summer temperatures of any major American city, even though other cities, like Seattle and Minneapolis, are much farther north. Very heavy fog rolls into parts of the city during the summer months because of wet winds from the Pacific Ocean mixing with warmer inland air. Fortunately, the winters are not very cold. San Francisco is also known for its rolling hills that are located all across the city. Streets that were built on these hills are very steep and tiring to walk on. That is why the many famous trolley cars jet up and down the hilly streets, making transportation a little easier for San Francisco's citizens.

Name: _____ Date: _____

1. Which statement most accurately describes the size of California?

A. California is the largest state in America.

B. California is the third-largest state in America.

C. California is one of the smallest states in America.

D. California is a state of average size in America.

2. The author contrasts San Francisco with San Diego and Los Angeles. How is San Francisco different from San Diego and Los Angeles?

A. The temperatures in San Francisco are much cooler.

B. The population of San Francisco is much higher.

C. Surfing is more popular in San Francisco.

D. The winters in San Francisco are warmer.

3. The climate of a city can influence its culture. What sentence from the text best supports this conclusion?

A. One interesting fact about San Francisco is that the city features the lowest average summer temperatures of any major American city.

B. There is a large surfing community in Los Angeles as well, but the city is best known as the center of the American film industry.

C. Over 38 million people call California home, which means about one out of every eight people in the United States of America lives there.

D. San Diego's economy gets a big boost from tourism, with approximately 30 million people visiting there every year to enjoy the sunny days. Because of the favorable climate, surfing has become one of the most popular local sports.

4. San Francisco's climate is colder and foggier than that of Los Angeles and San Diego. What is most likely an effect this climate has on San Francisco?

A. This climate makes San Francisco as popular a place to surf as San Diego or Los Angeles.

B. This climate means San Francisco has less surfing and moviemaking than southern cities like San Diego and Los Angeles.

C. This climate allows San Francisco to offer its people many outdoor activities that depend on the sun and warm weather.

D. This climate means San Francisco is full of people who stay inside most of the time and industries that are not weather-dependent.

5. What is this text mostly about?

A. how Los Angeles and San Diego are similar and different

B. why San Francisco is different from Los Angeles and San Diego

C. three cities in California

D. why the climates in California differ from region to region

6. Read the following sentence from the story: "That is why the many famous trolley cars **jet up and down** the hilly streets, making transportation a little easier for San Francisco's citizens."

The author uses the phrase "**jet up and down**" to describe what?

A. the way the trolley cars go at a pace that is frustrating for San Francisco's citizens

B. the way the trolley cars travel slowly

C. the way the trolley cars move at a regular pace

D. the way the trolley cars move quickly up and down the streets

7. Choose the answer that best completes the sentence below.

There is a large surfing community in Los Angeles, _____ the city is best known as the home of Hollywood.

A. because

B. but

C. then

D. on the other hand

8. List two facts the author provides about each city he describes.

_____

_____

_____

9. According to the text, how is San Francisco different from Los Angeles and San Diego? Use information from the text to support your answer.

_____

_____

_____

10. The author compares and contrasts the cities he describes in the text.

Use information from the text to support this statement.