6.E: Acellular Pathogens (Exercises)

6.1: Viruses

Viruses are generally ultramicroscopic, typically from 20 nm to 900 nm in length. Some large viruses have been found. Virions are acellular and consist of a nucleic acid, DNA or RNA, but not both, surrounded by a protein capsid. There may also be a phospholipid membrane surrounding the capsid. Viruses are obligate intracellular parasites.

Multiple Choice

The component(s) of a virus that is/are extended from the envelope for attachment is/are the:

A. capsomeres
B. spikes
C. nucleic acid
D. viral whiskers

B

Which of the following does a virus lack? Select all that apply.

A. ribosomes
B. metabolic processes
C. nucleic acid
The envelope of a virus is derived from the host's

A. nucleic acids  
B. membrane structures  
C. cytoplasm  
D. genome

The family name ends with ________ and genus name ends with ________.

A. −virus; −viridae  
B. −viridae; −virus  
C. −virion; virus  
D. −virus; virion

What is another name for a nonenveloped virus?

A. enveloped virus  
B. provirus  
C. naked virus  
D. latent virus

True/False

True or False: Scientists have identified viruses that are able to infect fungal cells.

True
Fill in the Blank

A virus that infects a bacterium is called a/an ___________________.

bacteriophage

A/an _________ virus possesses characteristics of both a polyhedral and helical virus.

complex

A virus containing only nucleic acid and a capsid is called a/an ___________________ virus or ___________________ virus.

naked or nonenveloped

The ____________ ____________ on the bacteriophage allow for binding to the bacterial cell.

tail fibers

Short Answer

Discuss the geometric differences among helical, polyhedral, and complex viruses.

What was the meaning of the word “virus” in the 1880s and why was it used to describe the cause of tobacco mosaic disease?

Critical Thinking

Name each labeled part of the illustrated bacteriophage.
In terms of evolution, which do you think arises first? The virus or the host? Explain your answer.

Do you think it is possible to create a virus in the lab? Imagine that you are a mad scientist. Describe how you would go about creating a new virus.

6.2: The Viral Life Cycle

Many viruses target specific hosts or tissues. Some may have more than one host. Many viruses follow several stages to infect host cells. These stages include attachment, penetration, uncoating, biosynthesis, maturation, and release. Bacteriophages have a lytic or lysogenic cycle. The lytic cycle leads to the death of the host, whereas the lysogenic cycle leads to integration of phage into the host genome.

Multiple Choice

Which of the following leads to the destruction of the host cells?

A. lysogenic cycle
B. lytic cycle
C. prophage
D. temperate phage

B
A virus obtains its envelope during which of the following phases?

A. attachment  
B. penetration  
C. assembly  
D. release  

D

Which of the following components is brought into a cell by HIV?

A. a DNA-dependent DNA polymerase  
B. RNA polymerase  
C. ribosome  
D. reverse transcriptase  

D

A positive-strand RNA virus:

A. must first be converted to a mRNA before it can be translated.  
B. can be used directly to translate viral proteins.  
C. will be degraded by host enzymes.  
D. is not recognized by host ribosomes.  

B

What is the name for the transfer of genetic information from one bacterium to another bacterium by a phage?

A. transduction  
B. penetration  
C. excision  
D. translation  

A
Fill in the Blank

An enzyme from HIV that can make a copy of DNA from RNA is called _________________.

reverse transcriptase

For lytic viruses, ________________ is a phase during a viral growth curve when the virus is not detected.

eclipse

Short Answer

Briefly explain the difference between the mechanism of entry of a T-even bacteriophage and an animal virus.

Discuss the difference between generalized and specialized transduction.

Differentiate between lytic and lysogenic cycles.

Critical Thinking

Label the five stages of a bacteriophage infection in the figure:

Bacteriophages have lytic and lysogenic cycles. Discuss the advantages and disadvantages for the phage.

How does reverse transcriptase aid a retrovirus in establishing a chronic infection?

Discuss some methods by which plant viruses are transmitted from a diseased plant to a healthy one.

6.3: Isolation, Culture, and Identification of Viruses

Viral cultivation requires the presence of some form of host cell (whole organism, embryo, or cell culture). Viruses can be isolated from samples by filtration. Viral filtrate is a rich source of released virions. Bacteriophages are detected by presence of clear plaques on bacterial lawn. Animal and plant viruses are detected by cytopathic effects, molecular
techniques (PCR, RT-PCR), enzyme immunoassays, and serological assays (hemagglutination assay, hemagglutination inhibition assay).

**Multiple Choice**

Which of the followings cannot be used to culture viruses?

A. tissue culture  
B. liquid medium only  
C. embryo  
D. animal host

B

Which of the following tests can be used to detect the presence of a specific virus?

A. EIA  
B. RT-PCR  
C. PCR  
D. all of the above

D

Which of the following is NOT a cytopathic effect?

A. transformation  
B. cell fusion  
C. mononucleated cell  
D. inclusion bodies

C

**Fill in the Blank**

Viruses can be diagnosed and observed using a(n) ____________ microscope.

Electron
Cell abnormalities resulting from a viral infection are called ____________ _____________.

- cytopathic effects

**Short Answer**

Briefly explain the various methods of culturing viruses.

**Critical Thinking**

Label the components indicated by arrows.

(credit: modification of work by American Society for Microbiology)

What are some characteristics of the viruses that are similar to a computer virus?

### 6.4: Viroids, Virusoids, and Prions

Other acellular agents such as viroids, virusoids, and prions also cause diseases. Viroids consist of small, naked ssRNAs that cause diseases in plants. Virusoids are ssRNAs that require other helper viruses to establish an infection. Prions are proteinaceous infectious particles that cause transmissible spongiform encephalopathies. Prions are extremely resistant to chemicals, heat, and radiation.

**Multiple Choice**

Which of these infectious agents do not have nucleic acid?
A. viroids  
B. viruses  
C. bacteria  
D. prions

D

Which of the following is true of prions?

A. They can be inactivated by boiling at 100 °C.  
B. They contain a capsid.  
C. They are a rogue form of protein, PrP.  
D. They can be reliably inactivated by an autoclave.

C

Fill in the Blank

Both viroids and virusoids have a(n) _________ genome, but virusoids require a(n) _________ to reproduce.

RNA, helper virus

Short Answer

Describe the disease symptoms observed in animals infected with prions.

Critical Thinking

Does a prion replicate? Explain.