

Cheat Sheet

The lytic cycle of a temperate phage. Phage genes, which are translated using the host machinery of the first phage after the viral DNA is injected into the host cell's DNA (step 2); protected from degradation because it contains a modified base, thymine, which is not recognized by the host's restriction enzymes. The entire cycle, from the first contact with the cell to lysis, takes place at 37°C.

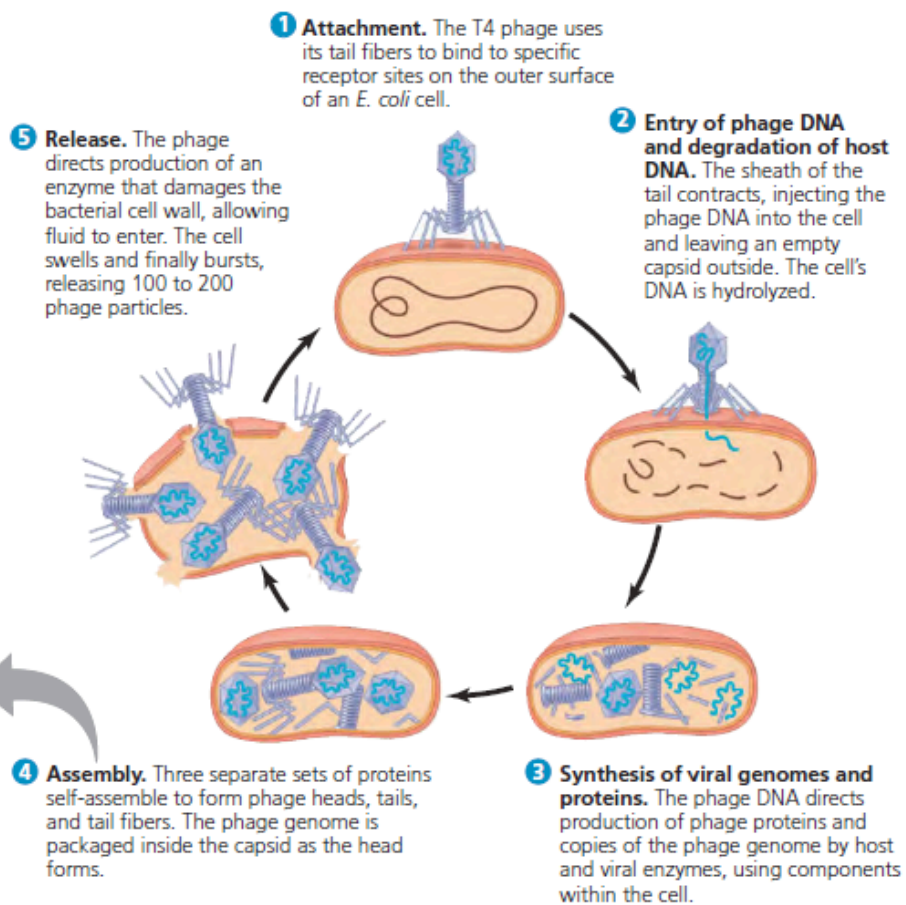
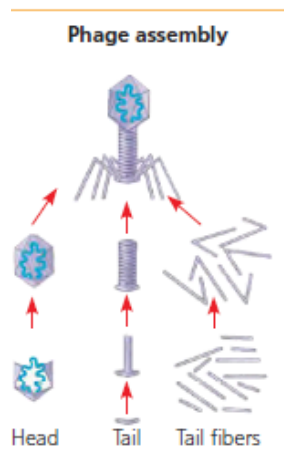


Table 19.1 Classes of Animal Viruses

Class/Family	Envelope	Examples That Cause Human Diseases
I. Double-Stranded DNA (dsDNA)		
Adenovirus (see Figure 19.3b)	No	Respiratory viruses; tumor-causing viruses
Papovavirus	No	Papillomavirus (warts, cervical cancer); polyomavirus (tumors)
Herpesvirus	Yes	Herpes simplex I and II (cold sores, genital sores); varicella zoster (shingles, chicken pox); Epstein-Barr virus (mononucleosis, Burkitt's lymphoma)
Poxvirus	Yes	Smallpox virus; cowpox virus
II. Single-Stranded DNA (ssDNA)		
Parvovirus	No	B19 parvovirus (mild rash)
III. Double-Stranded RNA (dsRNA)		
Reovirus	No	Rotavirus (diarrhea); Colorado tick fever virus
IV. Single-Stranded RNA (ssRNA); Serves as mRNA		
Picornavirus	No	Rhinovirus (common cold); poliovirus; hepatitis A virus; other enteric (intestinal) viruses
Coronavirus	Yes	Severe acute respiratory syndrome (SARS)
Flavivirus	Yes	Yellow fever virus; West Nile virus; hepatitis C virus
Togavirus	Yes	Rubella virus; equine encephalitis viruses
V. ssRNA; Template for mRNA Synthesis		
Filovirus	Yes	Ebola virus (hemorrhagic fever)
Orthomyxovirus (see Figures 19.3c and 19.9a)	Yes	Influenza virus
Paramyxovirus	Yes	Measles virus; mumps virus
Rhabdovirus	Yes	Rabies virus
VI. ssRNA; Template for DNA Synthesis		
Retrovirus (see Figure 19.8)	Yes	Human immunodeficiency virus (HIV/AIDS); RNA tumor viruses (leukemia)

Chapter 19 Questions

1. What is a virus?
2. What is tobacco mosaic disease?
3. What is a capsid?
4. What are helical and icosahedral viruses?
5. What are viral envelopes?
6. Where are many of the most complex capsids found?
7. What is the structure of influenza viruses?
8. What is the host range of a virus?
9. What is the lytic cycle?
10. What is the lysogenic cycle?
11. What are restriction enzymes?
12. What is the CRISPR-Cas system?
13. How does the structure of an animal virus differ from a phage?
14. What does an animal virus use an envelope to do?
15. How do enveloped viruses replicate?
16. How do herpesviruses work?
17. What are the classes of animal viruses? Classify the following viruses (class, envelope?, examples): Reovirus, Parvovirus, Adenovirus, Papillomavirus, Polyomavirus, Togavirus, Flavivirus, Coronavirus, Filovirus, Herpesvirus, Poxvirus, Picornavirus, Orthomyxovirus, Retrovirus, Paramyxovirus, Rhabdovirus
18. How does the replication of retroviruses occur?
19. What is a provirus?
20. What are plasmids?
21. What are transposons?
22. What is mimivirus?
23. What is pandoravirus?
24. What is *Pithovirus sibericum*?
25. What is a vaccine?
26. What is acyclovir?
27. What is azidothymidine (AZT)?
28. What is maraviroc?
29. What are viruses that suddenly become apparent called?
30. What is encephalitis?
31. What does the ebola virus cause?
32. What is chikungunya?
33. What is the Zika virus?
34. What is the difference between an epidemic and a pandemic?
35. What are the types of influenza virus?
36. What is H1N1?
37. What is horizontal transmission?

38. What is vertical transmission?

39. What are prions?

40. What are *Aedes aegypti* and *Aedes albopictus*?

Chapter 19 Answers

1. Infectious particle consisting of genes packaged in protein coat, smallest only 20 nm in diameter, largest is 1,500 nm, rigid, rod-shaped capsid made from single protein arranged in helix
2. Stunts growth of tobacco plants and gives leaves a mottled coloration, caused by tobacco mosaic virus (TMV), single helical RNA molecule
3. Protein shell enclosing viral genome built from protein subunits called capsomeres (not many types of proteins)
4. Rod-shaped, proteins arranged in helix in capsid
e.g. Adenoviruses (infect respiratory tracts of animals) have 252 identical protein molecules arranged in polyhedral capsid with 20 triangular facets (icosahedron), double-stranded DNA
5. Membranous envelope that surrounds capsids of influenza virus and other animal viruses, derived from membranes of host cell, contain proteins of viral origin
6. Bacteriophages (phages), infect bacteria (first seven phages studied named type 1(T1), T2, so on in order of discovery), T-even phages have elongated icosahedral heads enclosing DNA with protein tailpiece with fibers by which phage attaches to bacterial cell
7. Outer envelope studded with glycoprotein spikes, contains eight double-helical RNA-protein complexes each associated with viral polymerase
8. The host species that a virus can infect, results from viral recognition systems
9. Phage replicative cycle that culminates in death of host cell (phage that replicates only by lytic is called virulent phage), look at diagram for steps
10. Phages coexist in host cells in state called lysogeny (phages capable of lytic and lysogenic called temperate phages, phage λ is model), phage binds to surface and injects linear DNA, which forms circle. DNA incorporated into specific site on *E. coli* chromosome by viral proteins that break and join circular DNA molecules, integrated viral DNA called prophage, prophage propagated to daughter cells, environmental signal triggers switchover from lysogenic to lytic mode
11. Cellular enzymes that cut up phage enzyme
12. Clustered regularly interspaced short palindromic repeats (CRISPRs), different stretches of spacer DNA between repeats, spacers correspond to DNA that had infected cell. Cas (CRISPR-associated) proteins (nucleases) identify and cut phage DNA by interacting with CRISPR region. When phage infects cell, DNA of phage is integrated between repeat sequences. Same type of phage infecting cell triggers transcription of CRISPR region into RNA molecules that are cut into pieces then bound by Cas protein, leads Cas protein to invading phage DNA
13. Few phages have envelope or RNA, animal viruses have both, nearly all animal viruses with RNA genomes have envelope, some with DNA genomes have envelope

14. Enter host cell using viral glycoproteins that bind to receptors of host cell
15. Virus enters cell, viral genome creates RNA strands (viral RNA polymerase produces), mRNA produces glycoproteins in ER and capsids in cytoplasm, glycoproteins exported to plasma membrane, capsid surrounds genome and membrane with glycoproteins buds from plasma membrane
16. Cloaked in membrane derived from nuclear envelop of host, shed membrane in cytoplasm and acquire envelop from Golgi apparatus membrane, have double-stranded DNA genome, replicate within host cell nucleus, copies of viral DNA can remain as mini-chromosomes in nuclei of nerve cells
17. See image
18. Have enzyme called reverse transcriptase that transcribes RNA template into DNA (HIV, human immunodeficiency virus, is retrovirus that causes AIDS, acquired immunodeficiency syndrome), are enveloped viruses with two identical molecules of single-stranded RNA and two molecules of reverse transcriptase
19. integrated viral DNA that never leaves host's genome (characteristic of retroviruses)
20. Small, circular DNA molecules found in bacteria and yeasts (eukaryotes), can replicate independently of bacterial chromosome
21. DNA segments that can move from one location to another within a cells genome (mobile genetic elements)
22. One of largest viruses 15 years ago, dsDNA, icosahedral capsid (400 nm diameter), genome of 1.2 million bases, 1000 genes, some found only in cell genomes
23. 1 μm diameter with dsDNA of 2-2.5 Mb, 90% of genes unrelated to cellular genes
24. 1.5 μm diameter, 500 genes, after beings frozen for 30,000 years could still infect
25. Harmless derivative of a pathogen that stimulates the immune system to mount defenses against the harmful pathogen
26. Drug that impedes herpesvirus replication by inhibiting viral polymerase that synthesizes viral DNA
27. Drug, curbs HIV replication by interfering with synthesis of DNA by reverse transcriptase
28. Drug that blocks protein on human immune cell surface that helps bind the HIV virus
29. emerging viruses
30. inflammation of the brain
31. Hemorrhagic fever (fatal illness characterized by fever, vomiting, massive bleeding, and circulatory system collapse)
32. Mosquito-borne virus, causes acute illness, fever, rashes, persistent joint pain
33. Causes microcephaly (abnormally small brain), mosquito-borne flavivirus, infects neural cells
34. Widespread outbreak
global epidemic
35. A (infects wide range of animals, caused four major flu epidemics), B and C (infect only humans)
36. influenza A virus, have viral proteins hemagglutinin (HA, 16 types, helps virus attach to host cell) and neuraminidase (NA, 9 types, helps release new virus particles from infected cells), H1N1 = swine flu, infectious

- 37. Plant is infected from external source of virus
- 38. Plant inherits viral infection from parent
- 39. Proteins that appear to cause a number of degenerative brain diseases in various animal species, act very slowly, incubation of at least ten years, virtually indestructible
- 40. Related mosquito species