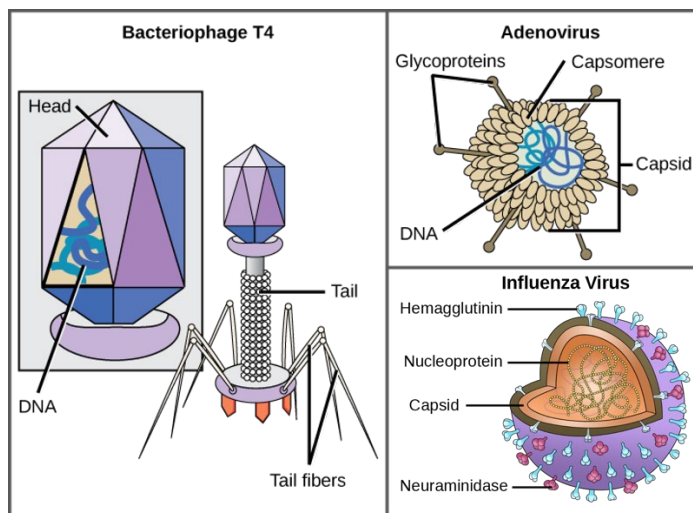


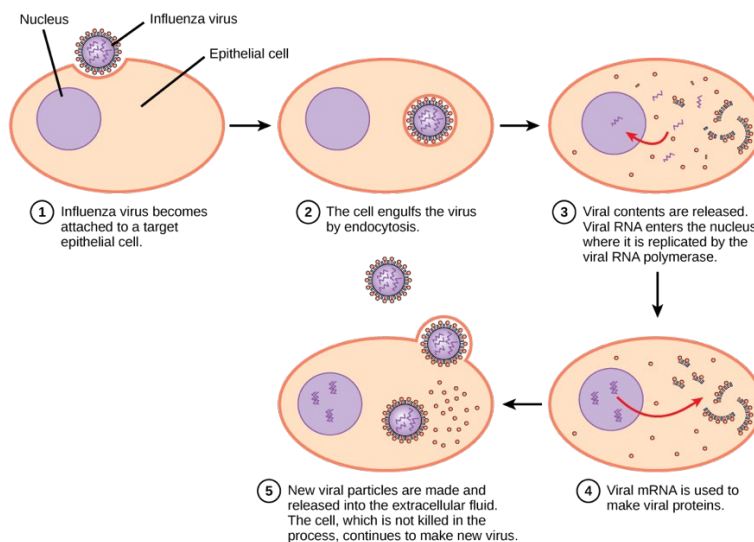
Biology 2eUnit 5: **Biological Diversity**Chapter 21: **Viruses****Visual Connection Questions**

1. Which of the following statements about virus structure is true?



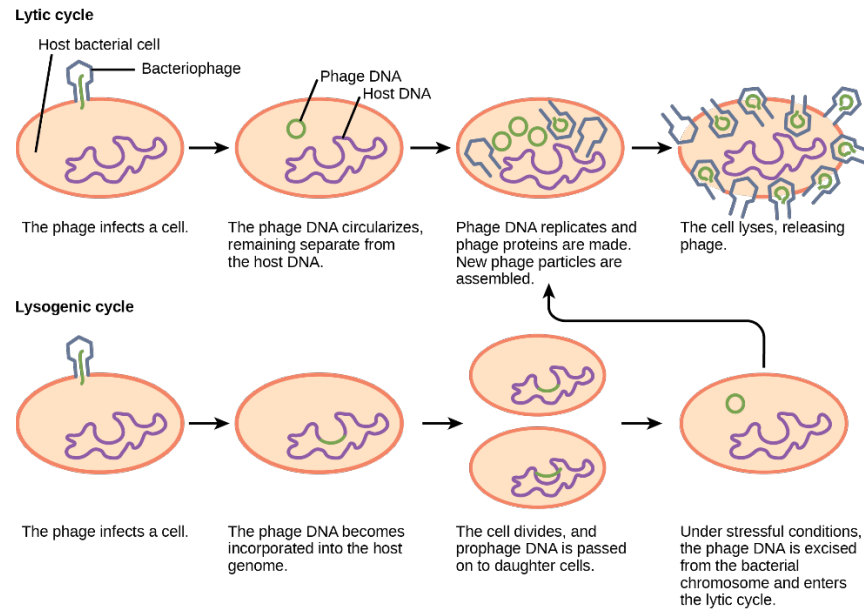
d. Glycoproteins help the virus attach to the host cell.

2. Influenza virus is packaged in a viral envelope that fuses with the plasma membrane. This way, the virus can exit the host cell without killing it. What advantage does the virus gain by keeping the host cell alive?



The host cell can continue to make new virus particles.

3. Which of the following statements is false?



c. An environmental stressor can cause the phage to initiate the lysogenic cycle.

Review Questions

4. Which statement is true?

b. Viruses are acellular.

5. The viral _____ plays a role in attaching a virion to the host cell.

d. both b and c (capsid and envelope)

6. Viruses _____.

d. vary in shape

7. The observation that the bacteria genus *Chlamydia* contains species that can only survive as intracellular parasites supports which viral origin hypothesis?

b. Regressive

8. A scientist discovers a new virus with a linear, RNA genome surrounded by a helical capsid. The virus is most likely a member of which family based off structure classification?

a. Rabies virus

9. Which statement is *not* true of viral replication?

d. Newly released virions can infect adjacent cells.

10. Which statement is true of viral replication?

b. During attachment, the virus attaches at specific sites on the cell surface.

11. Which statement is true of reverse transcriptase?

c. It transcribes RNA to make DNA.

12. Oncogenic virus cores can be_____.

d. either RNA or DNA

13. Which is true of DNA viruses?

a. They use the host cell's machinery to produce new copies of their genome.

14. A bacteriophage can infect _____.

d. bacteria

15. People with the CCR5 Δ 32 mutation of a T cell surface protein can be exposed to some strains of HIV-1 without becoming sick. What step of the virus life cycle is likely to be inhibited with this mutation?

a. Release

16. An apple grower notices that several of his apple trees with fungi growing on their trunks have developed necrotic ring spots, while other trees in the orchard that lack fungi appear healthy. What is the most likely conclusion the farmer can make about the virus infecting his apple trees?

a. The apple trees were infected by horizontal transmission

17. Which of the following is NOT used to treat active viral disease?

c. antibiotics

18. Vaccines_____.

d. stimulate an immune response

19. A patient presents at the clinic with an acute viral infection. Assays that analyze the viral life cycle classify the virus into Group V with a segmented genome. Which virus is the most likely diagnosis for the patient?

d. Influenza A virus

20. Which of the following is not associated with prions?

c. DNA

21. Which statement is true of viroids?

a. They are single-stranded RNA particles.

Critical Thinking Questions

22. The first electron micrograph of a virus (tobacco mosaic virus) was produced in 1939. Before that time, how did scientists know that viruses existed if they could not see them? (Hint: Early scientists called viruses “filterable agents.”)

Viruses pass through filters that eliminated all bacteria that were visible in the light microscopes at the time. As the bacteria-free filtrate could still cause infections when given to a healthy organism, this observation demonstrated the existence of very small infectious agents. These agents were later shown to be unrelated to bacteria and were classified as viruses.

23. Varicella zoster virus is a double-stranded DNA virus that causes chickenpox. How does its genome structure provide an evolutionary advantage over a single-stranded DNA virus?

Both viruses are made of DNA, but single-stranded DNA viruses lack the ability to create the double helix. Thus, double-stranded DNA viruses have a more stable genome due to the complementary base pairing, increasing the lifespan of the virus’s genome.

24. Classify the Rabies virus (a rhabdovirus family member) and HIV-1 with both the Baltimore and genomic structure systems. Compare your results, what conclusions can be made about these two different methods?

Rabies virus is a (-) strand RNA virus that transcribes mRNAs from its genome (Group V).

HIV-1 is a single-stranded RNA retrovirus that uses reverse transcriptase to create a double-stranded DNA copy of its genome that is integrated into the host human’s genome prior to making mRNAs (Group VI).

The genome structure system classifies both viruses as single-stranded RNA viruses with linear genomes.

Baltimore classification sorts Rabies virus and HIV-1 into two different groups, indicating that the two viruses have very different life cycles. However, genome structure classification does not distinguish between the two viruses. This leaves out important information regarding virus function and survival.

25. Why can’t dogs catch the measles?

The virus can’t attach to dog cells, because dog cells do not express the receptors for the virus and/ or there is no cell within the dog that is permissive for viral replication.

26. One of the first and most important targets for drugs to fight infection with HIV (a retrovirus) is the reverse transcriptase enzyme. Why?

Reverse transcriptase is needed to make more HIV-1 viruses, so targeting the reverse transcriptase enzyme may be a way to inhibit the replication of the virus. Importantly, by targeting reverse transcriptase, we do little harm to the host cell, since host cells do not make reverse transcriptase. Thus, we can specifically attack the virus and not the host cell when we use reverse transcriptase inhibitors.

27. In this section, you were introduced to different types of viruses and viral diseases. Briefly discuss the most interesting or surprising thing you learned about viruses.

Answer is open and will vary.

28. Although plant viruses cannot infect humans, what are some of the ways in which they affect humans?

Plant viruses infect crops, causing crop damage and failure, and considerable economic losses.

29. A bacteriophage with a lytic life cycle develops a mutation that allows it to now also go through the lysogenic cycle. How would this provide an evolutionary advantage over the other bacteriophages that can only spread through lytic cycles?

In a lysogenic cycle, the bacteriophage integrates into the host bacterium's genome as a prophage, and is passed on to daughter cells every time a bacterium carrying the prophage replicates. This allows the prophage to be dispersed through a wide population without killing any of the host cells. Since the mutated bacteriophage also retains the ability to switch into the lytic cycle, it now has two methods to disseminate through the bacteria population.

30. Why is immunization after being bitten by a rabid animal so effective and why aren't people vaccinated for rabies like dogs and cats are?

Rabies vaccine works after a bite because it takes week for the virus to travel from the site of the bite to the central nervous system, where the most severe symptoms of the disease occur. Adults are not routinely vaccinated for rabies for two reasons: first, because the routine vaccination of domestic animals makes it unlikely that humans will contract rabies from an animal bite; second, if one is bitten by a wild animal or a domestic animal that one cannot confirm has been immunized, there is still time to give the vaccine and avoid the often fatal consequences of the disease.

31. The vaccine Gardasil that targets human papilloma virus (HPV), the etiological agent of genital warts, was developed after the anti-HPV medication podofilox. Why would doctors still want a vaccine created after anti-viral medications were available?

Anti-viral medications treat HPV after the skin of the genitals has been infected. Conversely, Gardasil stimulates the immune system to prevent infection of the tissue, even if a person is exposed to HPV. Since HPV is often asymptomatic, particularly in men, the vaccine also controls the spread of disease (patients will not seek treatment for a disease if they do not realize they are infected).

32. Prions are responsible for variant Creutzfeldt-Jakob Disease, which has resulted in over 100 human deaths in Great Britain during the last 10 years. How do humans obtain this disease?

This prion based disease is transmitted through human consumption of infected meat.

33. How are viroids like viruses?

They both replicate in a cell, and they both contain nucleic acid.

34. A botanist notices that a tomato plant looks diseased. How could the botanist confirm that the agent causing disease is a viroid, and not a virus?

The botanist would need to isolate any foreign nucleic acids from infected plant cells, and confirm that an RNA molecule is the etiological agent of disease. The botanist would then need to demonstrate that the RNA can infect plant cells without a capsid, and that the RNA replicates, but is not translated to produce proteins.