Chapter 21 Exercises

Review Questions

1. Which statement is *true*?
- **a.** A virion contains DNA and RNA.
- **b.** Viruses are acellular.
- **c.** Viruses replicate outside of the cell.
- **d.** Most viruses are easily visualized with a light microscope.

2. The viral _____ play(s) a role in attaching a virion to the host cell.
- **a.** core
- **b.** capsid
- **c.** envelope
- **d.** both b. and c.

3. Viruses _____.
- **a.** all have a round shape
- **b.** cannot have a long shape
- **c.** do not maintain any shape
- **d.** vary in shape

4. The observation that the bacteria genus *Chlamydia* contains species that can only survive as intracellular parasites supports which viral origin hypothesis?
- **a.** progressive
- **b.** regressive
- **c.** self-replicating
- **d.** virus-first

5. 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 on structure classification?
- **a.** rabies virus
- **b.** herpesviruses
- **c.** retroviruses
- **d.** influenza viruses

6. Which statement is *not* true of viral replication?
- **a.** A lysogenic cycle kills the host cell.
- **b.** There are six basic steps in the viral replication cycle.
- **c.** Viral replication does not affect host cell function.
- **d.** Newly released virions can infect adjacent cells.

7. Which statement is *true* of viral replication?
- **a.** In the process of apoptosis, the cell survives.
- **b.** During attachment, the virus attaches at specific sites on the cell surface.
- **c.** The viral capsid helps the host cell produce more copies of the viral genome.
- **d.** mRNA works outside of the host cell to produce enzymes and proteins.

8. Which statement is *true* of reverse transcriptase?
- **a.** It is a nucleic acid.
- **b.** It infects cells.
- **c.** It transcribes RNA to make DNA.
- **d.** It is a lipid.

9. Oncogenic virus cores can be _____.
- **a.** RNA
- **b.** DNA
- **c.** neither RNA nor DNA
- **d.** either RNA or DNA

10. Which is *true* of DNA viruses?
- **a.** They use the host cell's machinery to produce new copies of their genome.
- **b.** They all have envelopes.
- **c.** They are the only kind of viruses that can cause cancer.
- **d.** They are not important plant pathogens.

11. A bacteriophage can infect _____.
- **a.** the lungs
- **b.** viruses
- **c.** prions
- **d.** bacteria

12. People with the CCR5Δ32 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
b. reverse transcription
c. uncoating
d. attachment

13. An apple grower notices that several of his apple trees have fungi growing on their trunks and have developed necrotic ring spots, while other trees in the orchard lack fungi and 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.
b. The fungi carry disease.
c. The fungi attract disease-carrying insects.
d. The apple trees were infected by vertical transmission.

14. Which of the following is *not* used to treat active viral disease?

a. vaccines
b. antiviral drugs
c. antibiotics
d. phage therapy

15. Vaccines _____.

a. are similar to viroids
b. are only needed once
c. kill viruses
d. stimulate an immune response

16. 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 does the patient most likely have?

a. rabies virus
b. picornavirus
c. HIV-1
d. influenza A virus

17. Which of the following is *not* associated with prions?

a. replicating shapes
b. mad cow disease
c. DNA
d. toxic proteins

18. Which statement is *true* of viroids?

a. They are single-stranded RNA particles.
b. They reproduce only outside of the cell.
c. They produce proteins.
d. They affect both plants and animals.

Critical Thinking Questions

19. 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.")

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

21. 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?

22. Why can't dogs catch the measles?

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

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

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

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

27. 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?

28. 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 antiviral medications were available?

29. 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 contract this disease?

30. How are viroids like viruses?

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