Viruses

Section 20-2

Is a Virus Alive?

Key Idea: Viruses are not considered living because they are missing key characteristics of living organisms.

Is a Virus Alive?

* Viruses do have genetic material, but they cannot reproduce on their own.
* Viruses reproduce by infecting cells.

* Viruses do not grow. Instead, they are assembled into their full size within a cell.
* Viruses do not carry out any metabolic activities, do not have any cytoplasm or organelles, and do not maintain homeostasis.

Viral Structure

Key Idea: All viruses have nucleic acid and a capsid.

* A capsid is a protein sheath that surrounds the nucleic acid core in a virus.
* An envelope is a membrane-like layer that covers the capsid of some viruses.
* A bacteriophage is a virus that infect bacteria.

Nucleic Acids

* The genetic material of a virus can be either RNA or DNA.

DNA viruses

* The genetic material of a DNA virus can become inserted into the host cell's DNA or may remain separate.
* The virus makes copies of its DNA by using the host cell's enzymes and nucleotides.

RNA Viruses

* The viral RNA may be used directly to make mRNA, which is used to make more viral RNA.
* The viral RNA is transcribed into DNA, inserted into the host cell's DNA, and then transcribed into viral mRNA.

Capsid

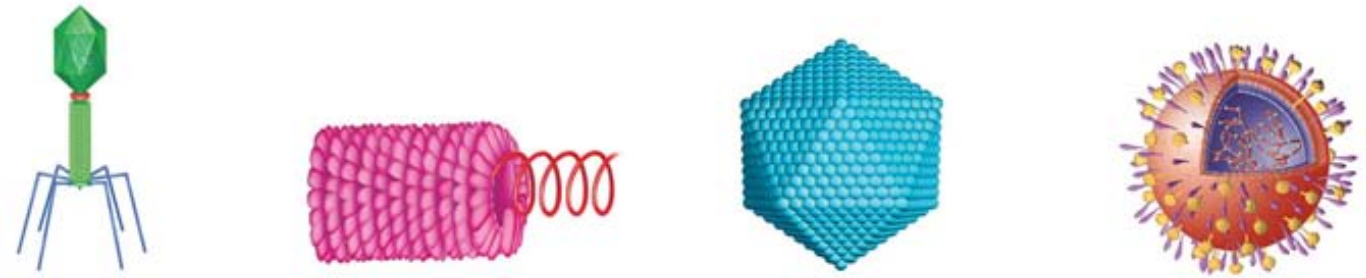
* The protein coat, or capsid, of a virus encloses its genetic material.
* The proteins on the host cell must match proteins on the capsid of the virus, as a key matches a lock.
* Capsids have a variety of shapes.

Envelope

* Many viruses, such as HIV, have a membrane, or envelope, surrounding the capsid.
* The envelope gives the virus an overall spherical shape, but the capsid can have a very different shape.

Tail Fibers

* The tail and tail fibers function like a tiny syringe, which injects the viral DNA into its bacterial host.



Reproduction

Key Idea: Viruses can reproduce by a lytic life cycle and a lysogenic life cycle.

* Lytic is a the cycle of viral infection, reproduction, and cell destruction.
* Lysogenic is when viral DNA becomes part of its host cell's DNA.

Lytic Cycle

* Viral genetic material that enters a cell but remains separate from the host cell's DNA.
* The virus uses the host cell's organelles, enzymes, and raw materials to replicate the virus's DNA and to make viral proteins.
* The proteins are assembled with the replicated viral DNA to form complete viruses.

* The host cell breaks open, releases newly made viruses, and dies.
* The new virus particles can infect other host cells.
* Viruses that reproduce only by the lytic cycle are often called virulent.

Lysogenic Cycle

* When the host cell replicates its own DNA, the cell also replicates the provirus.
* New cells are produced that contain the provirus.
* Many cells may be produced that contain the viral DNA.
* New virus particles are not assembled, and the host cell is not destroyed.

* After days, months, or even years, the provirus may leave the host's DNA and enter a lytic cycle.
* If the virus never enters the lytic cycle, it may become a permanent part of its host's genome.

Viroids and Prions

Key Idea: Viroids and prions are nonliving pathogenic molecules that are able to reproduce.

Viroids

* A viroid is a single strand of RNA that has no capsid.
* Viroids cause abnormal development and stunted growth in plants.

Prions

* *Prions* are nonfunctioning, misshapen versions of proteins.
* They attach to normal proteins that are found in the brain.
* Prions can be transmitted by eating food contaminated with infected brain tissue.