4. the origin of a class of organisms
5. drawing that shows evolutionary relationships with branches
6. an ancient, primitive domain

C. Stepped-Out Vocabulary
1. level within the Linnaean classification system; plural is taxa; 7 taxa in the Linnaean system
2. naming system that gives each species a 2-part name; uses Latin words; uses genus name and species descriptor
3. method commonly used to construct evolutionary trees; based on common ancestry; used to construct cladograms
4. trait present to different degrees among a group of species being studied; used in cladograms; represented by dashes
5. theoretical clock used to measure evolutionary time; based on mutation rates; must relate mutation rates to real time
6. DNA found in mitochondria; high mutation rate/passed down only from mother; used to study closely related species
7. RNA found in ribosomes; low mutation rate/lots of conserved regions; used to study distantly related species

D. Analogy Vocabulary Set
1. D3, A5
2. D1, A6
3. D6, A4
4. D5, A2
5. D4, A1
6. D2, A3

E. Cartoon Dialogue
1. Binomial nomenclature uses Latin words to give every species a scientific name.
2. Eukaryota. The kingdom Plantae is part of domain Eukarya because plants have eukaryotic cells.

F. Tree of Life Crossword Puzzle

Across
3. Bacteria
6. mitochondrial DNA
8. molecular clock
10. Eukarya
11. cladistics
12. Archaea
13. ribosomal RNA

Down
1. binomial nomenclature
2. taxonomy
4. cladogram
5. derived character
7. phylogeny
9. taxon

Section 18.1
Study Guide
1. respond to their environment, have genes, can be infectious, are single celled microorganisms, can reproduce on their own, classified in Linnaean system.
2. respond to their environment, have genes, are made only of a strand of DNA or RNA and a protein coat, can reproduce, but cannot reproduce on their own, small, not made of cells, not classified in Linnaean system, are infectious.
3. respond to their environment, have genes, can cause infection
4. Abilities to reproduce, use nutrients and energy, grow and develop, and to respond to the environment.
5. Virus: made of a strand of RNA or DNA and a protein coat, 50–200 nm. Viroid: made of strand of RNA, no protein coat, 50–150 nm, can cause disease in plants, cause infection through seeds or pollen. Prion: made of proteins that cause other proteins to misfold, no genetic material, 2–10 nm, incubate for a long time with no effect on host.

6. prion
7. pathogen
8. viroid
9. pathogen
10. prion
11. viroid
12. virus
13. virus

Power Notes
Virus: an infectious particle made only of a strand of DNA or RNA surrounded by a protein coat. size range: 50–200 nm
Viroid: an infectious particle that causes disease in plants. Made of a
single-stranded RNA without a protein coat. size range: 5–150 nm
Prion: an infectious particle made only of proteins that can cause other proteins to fold incorrectly. size range: 2–10 nm

Reinforcement
1. Bacteria are living organisms.
2. Prions contain no genetic material.
3. Viroids cause diseases specifically to plants.
4. A pathogen needs to get into its host undetected in order to reproduce.

Section 18.2

Study Guide
1. Sketches should reflect spiky enveloped, helical, and polyhedral shapes of the influenza, rabies, and foot-and-mouth viruses.
2. genetic material, capsid, lipid envelope
3. infect living host cells
4. by fitting its surface proteins to receptor molecules on the surface of the host cell
5. They have long tails with spiky footlike fibers that help attach the virus to the host cell. The tail sheath can contract and the tail core punches through the cell wall, injecting the DNA made by the host cell; or by fusing with the plasma membrane of the host cell.
6. Lytic cycle, infectious pathway, detrimental to host, viral DNA is replicated, directs host to make viral parts, releases new viral particles, breaks apart (lyses) the host cell
7. Lysogenic cycle, infectious pathway, detrimental to host, viral DNA is replicated, forms a prophage or provirus, can remain as a permanent gene, does not destroy the host cell
8. infectious pathways, detrimental to host, viral DNA is replicated
9. bacteriophage
10. prophage
11. capsid
12. lysogenic infection
13. lytic infection
14. Lytic cycle
Event 2: the viral DNA forms a circle
Event 3: the viral DNA directs the host cell to produce new viral particles that assemble into new bacteriophages.
Event 4: the host bacterium breaks apart and bacteriophages are released to infect new host cells.
Final outcome: The virus destroys the host cell.
Lysogenic cycle
Event 2: the viral DNA forms a prophage by combining with the host cell's DNA
Event 3: the prophage replicates along with the host cell's DNA
Event 4: many cell divisions produce a colony of cells infected with virus.
Final outcome: The prophage may leave the host's DNA and enter lytic cycle or may continue to incubate in the host cells.

Power Notes
Enveloped virus:
example: influenza
sketch: Sketch should show scrape envelope and should be labeled.

Helical virus
example: rabies
sketch: Sketch should be helical in shape and should be labeled.

Polyhedral virus
example: foot-and-mouth
sketch: Sketch should be polyhedral and should be labeled.

Reinforcement
1. A protein shell of a virus
2. helical, many-sided, spiky
4. A lysogenic cycle is associated with a prophage.
5. A lytic cycle, as new virions are being made and released, causing cells to burst. In a lysogenic infection, the virus can be present without damaging the cells.

13. chickenpox
14. mumps
15. hepatitis A

**Power Notes**

1. Common cold: More than 200 viruses cause this illness. Can mutate from one person to another.

2. Influenza: Spreads quickly and causes local epidemics. New vaccines are developed each year.


4. HIV: Retrovirus that destroys white blood cells of the host’s immune system and eventually causes AIDS.

5. The surface proteins on the capsids of the influenza virus have a high mutation rate.

6. AIDS destroys the white blood cells of a person’s immune system.

7. Vaccines are made from the same pathogen that they protect against. They are weakened versions or parts of the virus, that will cause the body to have an immune response. A vaccine prepares the host’s immune system for a future attack.

8. retrovirus
9. epidemic
10. vaccine

2. A vaccine exposes the body to an infectious agent, and the body responds by starting an immune response against the infectious agent.

3. It makes a DNA copy from RNA, using a unique enzyme called reverse transcriptase.

4. They both prepare the immune system to recognize the virus if future exposure to the same virus occurs.

**Section 18.4**

**Study Guide**

1. bacteria and archaea
2. marshes, the bottom of lakes, digestive tracts of herbivores.

**Y diagram:**

*Bacteria*—microscopic, single-celled, prokaryotes, have cell walls and membranes, move with flagella, diverse and widespread, 3 common shapes, flagella structurally different from archaea, cell walls and membranes chemically different from archaea.

*Archaea*—microscopic, single-celled, prokaryotes, have cell walls and membranes, move with flagella, often live in extreme environments, many shapes, flagella structurally different from bacteria, cell walls and

**Reinforcement**

1. There are many cold viruses and they can mutate rapidly.
membranes chemically different from bacteria. Both—microscopic, single-celled, prokaryotes, have cell walls and membranes, move with flagella

3. A method of reproduction in prokaryotes, meaning "division by half."

4. During conjugation, prokaryotes can exchange parts of their chromosomes through a hollow bridge of pili formed to connect two or more cells.

5. By forming an endospore.

6. A bacterium copies its chromosome and produces a wall around the copy. This thick wall around the bacterial DNA helps it survive harsh conditions.

7. facultative aerobe
8. flagellum
9. aerobe
10. endospore
11. conjugation
12. anaerobe
13. plasmid

**Power Notes**

- obligatory anaerobe: cannot live in the presence of oxygen
- facultative aerobe: can survive whether oxygen is present or not
- obligatory aerobe: needs oxygen to survive

**Structural Characteristics**

- Bacteria: 3 common forms: rod, spiral, and spherical; flagella structurally different from archaea;

- Archaea: many shapes; flagella structurally different from bacteria

**Molecular Characteristics**

- Bacteria: cell walls have a polymer called peptidoglycan;
- Archaea: cell membranes contain lipids found in no other organism

1. plasmid
2. cell wall
3. cell membrane
4. chromosome
5. pili
6. flagellum

**Reinforcement**

1. obligate aerobes
2. It is circular and is surrounded by cytoplasm (not enclosed in a nucleus).
3. Molecular evidence

**Section 18.5**

**Study Guide**

1. They break down food, make vitamins and compounds, and fill niches that may otherwise be filled by disease-causing bacteria.
2. They provide them with food and a home that has stable conditions.
3. yogurt, cheeses, pickles, soy sauce, sauerkraut, vinegar
4. photosynthesizing bacteria produce oxygen
5. recycle carbon, nitrogen, hydrogen, and sulfur through the ecosystem
6. convert atmospheric nitrogen into ammonia and other nitrogen compounds that plants can then use

7. in nodules on the roots of the plants
8. The bacteria capture nitrogen gas from the air trapped in the soil. They combine the nitrogen with hydrogen to produce ammonia that the plants can then use.
9. they can be used to clean up oil spills
10. the ability of bacteria to break down a material
11. some types of plastics are not biodegradable
12. Bioremediation is the use of living things, such as bacteria, to remove or neutralize contaminants such as polluted soil or water.

**Power Notes**

**Provide nutrients:** Within animal bodies, prokaryotes break down food and make vitamins and other compounds. They also ferment foods that humans eat, such as yogurt and cheeses.

**Benefit ecosystems:** Produce oxygen through photosynthesis, and help recycle carbon, nitrogen, hydrogen, and sulfur through the ecosystem.

**Fix nitrogen:** Convert atmospheric nitrogen into ammonia and other nitrogen compounds that plants can then use. Supply usable nitrogen to ecosystems.
**Bioremediation:** Break down pollutants, such as oil, into nontoxic or less-toxic compounds.

**Reinforcement**
1. Prokaryotes break down food and help us absorb nutrients, as well as make vitamins and take up space that harmful bacteria might otherwise fill.
2. Most types of bacteria are not disease-causing.
3. Some prokaryotes produce oxygen through photosynthesis. Others recycle elements through the ecosystem. Some prokaryotes fix nitrogen, converting it to a form that is usable by other organisms.
4. Through bioremediation, and by automatically breaking down anything that is biodegradable in the environment.

**Section 18.6**

**Study Guide**
1. by invading tissues and attacking cells, or by making toxins that are carried throughout the body by blood
2. because their immune system acts to defeat the infection without the infection ever causing symptoms
3. From foods contaminated by bacteria after they have been cooked and not refrigerated, or by eating foods that were contaminated with endospores and improperly canned.

4. Antibiotics work by affecting parts of bacterial cells that animal cells don’t have. Since viruses also do not have bacterial parts, they remain unaffected by antibiotics.
5. bacteria and fungi
6. Answers include: wash hands frequently, don’t eat foods that may have spoiled, don’t touch your nose or mouth

7. **Overuse:** Answer should include natural selection in bacteria occurring through overexposure to antibiotics.
8. **Under use:** Answer should include not killing the entire population of bacteria by not finishing the prescribed dose of antibiotic.
9. **Misuse:** Answer should include using antibiotics for reasons other than treating illness.

10. toxin
11. antibiotic
12. tetanus
13. anthrax
14. acne
15. Lyme disease
16. tooth decay

**Power Notes**
1. **Tuberculosis:**
   *Mycobacterium tuberculosis* bacteria multiply in the lungs, killing white blood cells. The host responds to the infection by releasing enzymes that cause swelling, which damages the host’s lungs.
2. **Staph poisoning:** *Staphylococcus aureus* can be transferred to food when food handlers don’t wash their hands after they blow their nose. Foods can be contaminated with staph after they have been cooked, and will multiply if the food is not refrigerated.
3. **Botulism:** This illness is caused by the eating of improperly canned foods that were contaminated with endospores of *Clostridium botulinum* before being sealed.
4. **Flesh eating infection:** caused by *Streptococci* bacteria colonizing tissues they do not usually encounter through a cut, scrape, or surgical incision.

**Cause**

**Overuse:** Using antibiotics when bacteria are not causing an illness may create an environment that may make some bacteria resistant to antibiotics through exposure.

**Underuse:** Failure to take the entire course of antibiotics may just kill the weak bacteria and allow the stronger bacteria the exposure that will make them resistant to future antibiotics.

**Misuse:** Using antibiotics for reasons other than bacterial illness can create resistant bacteria.