Chapter 21: Evidence and Mechanisms of Evolution

21.1

1. In everyday speech, people tend to use the word “theory” to mean an untested hypothesis, or even a guess. But how is the term “theory” used in science?
2. What are three major parts of Darwin’s theory of evolutionary change?
3. What is natural selection? What is artificial selection? How are they similar? How are they different?
4. Explain the meaning of the saying “individuals do not evolve; populations do.”
5. What is adaptation?
6. What is the “modern synthesis”?
7. What’s the difference between phenotype and genotype?
8. What are alleles? What is the gene pool?
9. How is it possible that individuals with two different genotypes can have the same phenotype?
10. Understand and be able to use the allele frequency equation: p + q = 1.
11. What does the Hardy-Weinberg equilibrium describe?
12. What conditions must be met for a population to be at Hardy-Weinberg equilibrium? There are five.
13. Understand and be able to use the genotype frequency equation: p2 + 2pq + q2 = 1.
14. Understand the example in Figure 21.7 that uses the two equations.
15. Why is the Hardy-Weinberg equilibrium model considered so important for the study of evolution? Give two reasons.

21.2

1. Known evolutionary mechanisms include what? List five.
2. Describe the role of mutations in evolution.
3. What is gene flow?
4. What is genetic drift? How does a population bottleneck cause genetic drift? How does the founder effect cause genetic drift?

21.3

1. Describe the following types of natural selection:
   1. Stabilizing selection
   2. Directional selection
   3. Disruptive selection
2. Describe the role of sexual selection in evolution and give two examples.

21.4

1. How does sexual reproduction contribute to genetic diversity?
2. Describe some advantages of sexual reproduction.
3. Provide an example of heterozygote advantage.

21.5

1. What are the constraints on evolution?

Chapter 22: Reconstructing and Using Phylogenies

22.1

1. What is phylogeny? What are phylogenetic trees?
2. What is a clade? How can you identify a clade on a phylogenetic tree?
3. What is the tree of life?
4. What are homologous features?
5. Not all similar traits are evidence of relatedness, however. Give two examples of how similar traits can develop in *unrelated* groups.

22.2

1. Understand how the phylogenetic tree in Figure 22.5 was constructed from the information in Table 22.1.
2. Briefly explain how the following are used to construct phylogenetic trees
   1. morphology
   2. development
   3. paleontology
   4. behavior
   5. molecular data
3. No questions.
4. What is binomial nomenclature?
5. What’s the difference between monophyletic, polyphyletic, and paraphyletic groups? Figure 22.14 is very helpful.

Chapter 23: Species and Their Formation

23.1

1. Explain the “Biological Species concept”. Describe its strengths and weaknesses.
2. Why does a biological species have to be reproductively isolated from other organisms?

23.2

1. Compare allopatric and sympatric speciation. Provide an example for each.

23.3

1. Briefly explain the following pre-zygotic reproductive barriers
   1. habitat isolation
   2. temporal isolation
   3. mechanical isolation
   4. behavioral isolation
   5. gametic isolation
2. Briefly explain the following post-zygotic reproductive barriers
   1. low hybrid zygote viability
   2. low hybrid adult viability
   3. hybrid infertility

23.4

1. Discuss factors resulting in various speciation rates.
2. Explain how varying speciation rates result from adaptive radiation.

An additional resource:

Bozeman Science YouTube videos: Natural selection, Examples of natural selection, Evidence for evolution, Hardy-Weinberg equation, Solving Hardy-Weinberg problems, Genetic drift, Phylogenetics, Speciation, Speciation and extinction, Evolution continues.