The Origin of Species
Chapter 22, 23, 24

1. Use the concept of descent with modification to explain both the unity and diversity of life.
2. Explain the difference between natural selection and evolution.
3. If you discovered a fossil of an extinct mammal that lived at high altitude in the Andes, would you predict that it would more closely resemble present day mammals from South American jungles or present-day mammals that live at high altitudes in the Himalayas? Justify your response.
4. Explain why genetic variation within a population is a prerequisite for evolution.
5. Why do we think of populations, rather than individuals, as evolving?
6. Why are only a small fraction of mutations preserved and become widespread in a population?
7. If a population stopped reproducing sexually, but still reproduced asexually, predict how the genetic variation would change over time.
8. Suppose that in a particular pea population, flowers with the white phenotype are favored by natural selection. Predict what would happen over time to the frequency of the p allele in the population. Justify your response.
9. A population has 700 individuals, 85 of genotype AA, 320 of genotype Aa, and 295 of genotype aa. State the frequencies of alleles A and a.
10. A population in Hardy-Weinberg equilibrium contains 450 individuals, 91 of which display the recessive phenotype. State the frequency of each genotype.
11. A gene that affects susceptibility to a degenerative brain disease has two alleles, V and v. In a population, 16 people have genotype VV, 92 have genotype Vv, and 12 have genotype vv. Is this population evolving? Justify your response.
12. Why can we say that natural selection is more "predictable" than genetic drift?
13. Distinguish between genetic drift and gene flow in terms of how they occur and their effects on future genetic diversity.
14. Suppose two plant populations exchange pollen and seeds. In one population, individuals of genotype AA are more common (9,000 AA, 900 Aa, 100 aa), while the opposite is true in the other population (100 AA, 900 Aa, 9,000 aa). If neither allele has a selective advantage, what will happen to the allele and genotype frequencies of these two populations over time?
15. How do the bottleneck effect and founder effect contribute to changing allelic frequencies?
16. Use the mice in Madeira and yarrow plants in the Sierra Nevada mountains to explain how geographic isolation and habitat differences can result in changes in populations.
17. Consider a population in which individuals heterozygous at a certain locus have an extreme phenotype (such as being larger than homozygotes) that confers a selective advantage. Does this represent directional, disruptive, or stabilizing selection?
18. How do diploidy and heterozygote advantage help preserve variation?
19. How can sexual selection contribute to increased sexual dimorphism?
20. Why is evolution unable to produce Aperfect@ organisms?
21. Suppose two bird species live in a forest and are not known to interbreed. One species feeds and mates in the treetops and the other on the ground. In captivity, the birds can interbreed and produce viable, fertile offspring. Describe the type of isolating mechanism that most likely separates these species in nature.
22. Summarize the differences between allopatric and sympatric speciation. Which one is more common?
23. Is allopatric speciation more likely to occur on an island close to a mainland or on a more remote island of the same size? Explain your answer.
24. Many plant species have arisen through sympatric speciation by means of polyploidy. Describe how an error during meiosis could result in polyploidy.
25. Explain the difference between punctuated equilibrium and gradualism? How can the fossil record make gradualism appear like punctuated equilibrium?

26. How is it that complex structures like the eye could have arisen?
27. How can heterochrony provide an explanation for the diversity we see among organisms?
28. How can homeotic genes be used to explain macroevolution?