Name: _____ **AP Biology** [redacted]

Chapter 18 Active Reading Guide
Genomes and Their Evolution

Most AP Biology teachers think this chapter involves an advanced topic. The questions posed here will help you understand the general concepts over much of the chapter as well as a few more detailed questions in areas that are typical of biology courses at the freshman college level.

Section 1

1. Craig Venter used an approach to genome sequencing termed the whole-genome shotgun approach. Explain how this concept can be used to sequence genomes.

2. What is a metagenome? How is metagenomics being used?

Section 2

3. Bioinformatics is the application of statistics and computer science to the field of molecular biology. Describe four important examples of information that is available through bioinformatics.

4. What is the goal of scientists who study proteomics?

5. How might a human gene microarray chip be of medical importance?

Section 3

6. How do prokaryotic genomes of the two domains Bacteria and Archaea compare to eukaryotic genomes?

7. What relationship, if any, does a comparison of eukaryotic genomes indicate? Explain your response.

8. How are humans able to successfully compete in nature even though they have about the same number of genes as the nematode worm *C. elegans*?

9. What relationship does Chart 18.1 indicate for gene density comparisons between prokaryotes and eukaryotes?

Section 4

10. Define the following two terms-
    pseudogene:

    repetitive DNA:

11. What are transposable elements, and what percentage of our genome is made of them?

12. Using Figure 18.5 in your text as a guide, list the types of DNA sequences in the human genome (greatest percentage first).

13. What is the difference between a “copy and paste” transposon and a “cut and paste” transposon?

14. Retrotransposons move by means of an RNA intermediate. Explain how these common transposons accomplish this movement.

15. What is the role of reverse transcriptase? How might retroviruses be related to retrotransposons?

16. Transposons and retrotransposons comprise 20–50% of most mammalian genomes. What possible function might they have?

17. What are short tandem repeats (STRs), and why is the Innocence Project interested in them?

18. Describe and give an example of each of the following-
multigene families of identical DNA sequences:

multigene families of nonidentical genes:

19. How is fetal hemoglobin different from adult hemoglobin? What is the selective advantage of these different β-globin genes?

Section 5

20. Describe how the chromosome banding pattern may explain why there are different haploid chromosome numbers for humans (n = 23) and chimpanzees (n = 24).

21. What is the evolutionary significance of the relationship between the genes on human chromosome 16 and those same blocks of genes on mouse chromosomes 7, 8, 16, and 17?

22. A good summary of several processes involved in genomic evolution can be found in the globin gene families. Explain these processes as described in Figure 18.13 in your text.

23. Using the concept of a protein domain in your answer, explain how exon shuffling could lead to new proteins with novel functions.

24. Transposable elements contribute to genome evolution in several ways. Describe three.
    1)

    2)

    3)

Section 6

25. When comparing genomes, we find that the more _____ in sequence the genes and genomes of two species are, the more closely related those species are in their _____ history.

26. What does it mean to say that a gene is highly conserved?

27. What are three genes that are evolving much faster in humans than chimpanzees?
    1)

    2)

    3)

28. What are SNPs and why are they important?

29. What is evo-devo, and how does it relate to understanding the evolution of genomes?

30. Explain what a homeobox is, and describe how it functions.

31. Homeoboxes are common to flies and mice. Given this similarity, explain why these animals are so different.