1. Define: (3 pts each)
   A. preadaptation
   B. homeobox
   C. Williston’s law
   D. homology
   E. Red Queen hypothesis
   F. heterochrony
   G. genetic drift
   H. intrasexual selection
   I. genetic homeostasis
   J. method of tenacity
   K. inclusive fitness
   L. Carboniferous period

2. Define homeodomain. What sorts of genes influence such a domain and how might they likely lead to adaptive saltationist jumps? (20 pts)

3. Distinguish between punctuated equilibrium and gradualism. What evidence is used to support each of these schools of thought. How has the controversy between these two been largely resolved. (18 pts)

4. Describe how insect wings might have evolved such that all intermediate stages in their evolution were adaptively more fit than what came before. (15 pts)

5. Why is allopatric speciation considered to be a more likely process than other types? Distinguish between parapatric and peripatric speciation. (18 pts)

6. What do heritability estimates tell us about: 1) genetic influence on the development of an organisms’s traits, 2) selective effects on past evolution of a trait, 3) future potentials for evolutionary change in a trait (21 pts)

7. What was it about genetics in Darwin’s day that led many scientists to doubt the importance of natural selection as an evolutionary force? (10 pts)

8. Provide evidence that the end Cretaceous extinction might have been caused by the impact of a large meteorite on the Earth. Is this explanation of the extinction an example of a catastrophism or uniformitarianism? Logically support your answer. (20 pts)

9. Why is a small migrating population of individuals usually not a random genetic sample of the resident population they derived from? What implications does this have for speciation? (12 pts)
10. We have a population with the following characteristics:

<table>
<thead>
<tr>
<th>Genotypes</th>
<th>DD</th>
<th>DE</th>
<th>EE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population sizes</td>
<td>50</td>
<td>100</td>
<td>350</td>
</tr>
<tr>
<td>Avg # offspring</td>
<td>8</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

A) What are the gene and genotype frequencies in the population? Is it in a Hardy/Weinberg equilibrium? Why or why not? (10 pts)

B) What are the fitnesses and selection coefficients of each genotype? What is the average fitness of the population? In general, describe the expected trends in the changes in each genotype frequency, given the reproductive differences shown. What will be the equilibrium gene frequencies if these fitnesses remain stable over time? (20 pts)

MERRY CHRISTMAS
FROM AN OLD FOSSIL