Dr. Reichler's Bio 301M Exam #1 June 17, 2008 Print Name: KEY

These questions have specific answers, although for some, more than one answer is possible. To receive full credit you must clearly and fully answer the question being asked. The points for each question are noted in parentheses totaling 103 points.

1. Using rules one and two of Strong Inference answer the following question: What is the function of the non-gene parts of human DNA? (10 pts)
Propose at least two hypo's- It has regulatory information. It is an energy source. It has no function. Propose at least one experiment to disprove the hypotheses- Eliminate the non-gene DNA and see if the cell still has energy, etc.

2. Using data obtained showing a similarity between two identical twins that grew up in different families, researchers claim to show that choosing a major is purely genetic. Give **two** reasons for why these researchers did not use Strong Inference. (10 pts)
Any two of: They did not have any controls. They did not study enough subjects. They were uswing proof.

3. You are able to obtain the mitochondrial DNA sequence from a human fossil, but the human fossil's mitochondrial DNA does not match any of the sequences from living humans. Give one explanation for this. (10 pts)
Any one of: The individual only had male offspring or was a male and did not pass on his mtDNA. Basically this sequence did not get passed on to the present day.

4. A very effective insecticide is sprayed on a field of crops. Initially the population of bugs goes down, but then increases again. When you test the bugs, they are resistant to the insecticide. Did the environment cause this new trait? Why or why not? (10 pts)
No, the trait already existed. The susceptible individuals were not able to reproduce while the resistant individuals kept reproducing.

5. You are studying two populations of birds in different geographic regions. The birds from the two populations look similar, and you want to determine if they are the same or different species. In captivity they produce fertile offspring.
a) Why would need to know something about their migration patterns to make a final determination? (5 pts)
We need to know if they ever are in the same place sop they can actually reproduce with each other.

b) While these two different populations are similar looking, there are some morphological differences between the two populations. Based on this information, are the environments where these two populations of birds live the same or different? Why? (5 pts)
Different. The differences between the two populations indicate that they are exposed to different environmental conditions.

6. Someone is accused of murder because their mitochondrial DNA sequence matches the mitochondrial DNA sequence found in some blood from the victim's shirt. Based on this evidence, is this accusation valid? Why or why not? (10 pts)
No, millions of people have the same mtDNA sequences.

7. Fireflies produce light, and that light allows them to attract a mate, but it also makes it easier for predators to see them. A firefly that cannot emit light is born. Would you predict that there would be an increase in non-light emitting fireflies in future generations? Why or why not? (10 pts)
No, even thought the non-light emitting firefly may live longer, he will not be very successful at producing offspring, and it is unlikely that this trait will be passed on.

8. What would be one reductionistic and one holistic perspective on the sickle-cell mutation? (5 pts)
Reductionistic- the lack of efficient oxygen transport or circulation due to changes in the hemoglobin protein.
Holistic- the correlation or coincidence of sickle-cell anemia and the prevalence of malaria.

9. Would differences in academic performance based on birth month be a genetic (nature) or environmental (nurture) affect? Why? (5 pts)
Nurture. The difference is when someone is born, which does not change genes, but is an environmental affect.

10. If you knew the amino acid sequence for every protein coded for by someone's mitochondrial DNA, would you be able to make any useful comparisons of this person's mitochondrial DNA to someone else's? Why or why not? (10 pts)
No. Redundancy in the genetic code means that you will not know the specific mtDNA sequence. OR mtDNA comparisons are done by non-gene DNA. Proteins are coded for by genes.

11. What are one similarity and one difference between people's reactions to receiving negative reinforcement (being shocked) when exposed to pictures of snakes versus when being exposed to pictures of people with a different skin color than themselves? (10 pts)
Similarity- the fear of both remains after the negative reinforcement is removed.
Difference- the fear of snakes is likely genetic while the fear of people with different skin color is learned.

Bonus: What are one similarity and one difference between Lamarckian and Darwinian mechanisms of evolution? (3 pts)
Similarity- changes occur via reproduction.
Difference- Lamarckian says that changes accrued during life are passed on. Darwinian says that genetic diversity and the environment mean that not everyone equally passes on genes.