Free-Response Questions for Big Idea #1

Directions: On the AP biology exam, there will be 8 free-response questions. They will have a variety of lengths and be worth a variety of points. Longer essays are worth up to 10 points. Short essays of 2, 3, 4 or 6 points are possible as well. For these questions, follow the given instructions. Write clear complete responses in complete sentences for each question. Grading rubrics for these practice free-response questions are provided in the teacher's manual that accompanies this review book.

1. 10 points are possible on this question.

The frequency of the sickle cell disease in parts of Central Africa is as high as 10% compared to a frequency of .5% in the United States.

a. Why are the frequencies of these traits different in these two areas? Explain why and how these differences are possible.
b. Use the percentage for the western Africa population and the US population to calculate the frequency of the heterozygous and homozygous dominant genotypes in each of these areas.
c. Is there evidence of heterozygote advantage in either one of these populations? Explain the evidence of lack or evidence.

2. 4 points are possible on this question.

A population of crickets feeds on two species of weedy plant (A and B). Both plants are spread across the habitat range of this population. There aren't any physical barriers to prevent crickets from moving between the plants. After many generations, the crickets that were born on plant A have begun to only eat plant A and mate with other plant A crickets. The crickets born on plant B have begun to eat only plant B and mate with only plant B crickets.

a. Is there evidence for speciation in this population? Explain the evidence.
b. Is this an example of sympatric or allopatric speciation? Explain your response. What kinds of isolating mechanisms are present in this population?