

**GRADING RUBRICS FOR FREE RESPONSE QUESTIONS FOR BIG IDEA #1**

**Introduction:** On the AP exam, there will be 8 free response questions. They will range in size from 2 to 10 points. So, students must practice writing essays of varying lengths. Included in this section are the grading rubrics for the practice free response questions for Big Idea #1 about evolution in the student manual.

**QUESTION #1****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 or lack of evidence.

**GRADING RUBRIC FOR QUESTION #1****PART A (3 POINT MAXIMUM)**

One point would be given for any of the following statements.

- The ecosystems in Central Africa and the United States are not the same.
- Central Africa is tropical
- Central Africa has an increase in insects like mosquitoes
- Central Africa has an increase in the presence of malaria
- Sickle cell trait gives partial resistance to malaria
- Sickle cell trait and heterozygotes are more frequent in malaria areas.

**PART B (6 POINT MAXIMUM)**

One point would be given for each correct frequency. If the student gets the correct frequency, they can earn a second point for showing appropriate calculations for that frequency.

- Heterozygous frequency for Africa is 43.2%
- Homozygous dominant frequency for Africa is 46.8%
- Heterozygous frequency for US is 13.2%
- Homozygous dominant for US is 86.3%

**PART C (3 POINT MAXIMUM)**

One point would be given for any of the following statements.

- Heterozygote advantage occurs when there is a large amount of heterozygous individuals.
- Heterozygote advantage is evident in African population.
- No heterozygote advantage in US population.
- Heterozygotes have a partial resistance to malaria.

**QUESTION #2****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?

**GRADING RUBRIC FOR QUESTION #2****PART A (2 POINT MAXIMUM)**

One point would be given for any of the following statements.

- Yes, there is evidence for speciation in the crickets.
- Limited inbreeding in the starting group leads to speciation
- There is evidence of reproductive isolation

**PART B (2 POINT MAXIMUM)**

One point would be given for any of the following statements.

- It is an example of sympatric speciation.
- There aren't any geographic barriers separating the population.
- Habitat isolation is happening.
- The individuals that feed on the different plants are becoming isolated to their respective host plants.