**Designing a Model**- Hardy Weinberg Lab(s):

College Board requires the student design a model in AP Bio for this lab. ***You may either:***

1. Do the one at the end of the HHMI Population Genetics Lab OR
2. Computer generate one with Allele A1 software.

**If you pick the latter option, here’s what you must do:**

Individual Investigation

You will now use the Allele A1 software to investigate a question of interest to you. You should plan to do one full investigation in which you investigate a question by altering the settings in the simulation. A full investigation may include running the simulation multiple times, sometimes with the same settings to see if the results are always the same, and sometimes with different settings to see the effect of a given variable. Your questions should be relatively sophisticated. ***Leaving all the settings at the default values and just changing the initial frequency of A1 is not a sophisticated investigation***.

Not sure what you want to investigate? Here are some parameters to consider, but do not feel that you are limited by this list. You can also combine some of these to get at specific situations.

* **Migration:** Allele A1 is set up to model an island population. The parameter called *Fraction of migrants each generation* determines the number of individuals that move from the mainland to the island every generation, as a fraction of the island population. For example, setting the parameter to 0.1 means that each generation 10% of the individuals in the island population are new immigrants from the mainland. The value you put in here can be quite low (ex: 0.0001). The parameter called *Frequency of A1 in the source pop’n* determines the frequency of allele A1 on the mainland (and thus among each generations migrants).
* **Selection:** You can have the fitness of the different genotypes (A1A1, A1A2, and A2A2) vary. Perhaps heterozygotes are the ‘most fit’, for example. Perhaps the genotypes that is the most beneficial on the island is not the genotype that is the most beneficial on the mainland, and there is migration. Your values for fitness can be quite different for the three genotypes (ex: 1.0, 0.4, 0.01) or rather similar (1.0, 0.95. 0.9). Note that fitness values of the three genotypes do not have to add up to 1.0.
* **Population size:** This may be investigated, but do **not** simply repeat what you did in the first part of this lab.
* **Rarity of allele:** You can set the starting frequency of A1 to 0.005, for example, which would make it quite rare. Or you can make it common.
* **Mutation rate:** The original settings have the mutation rates equal to zero, but that can be changed. Typically, mutation rates are quite low, say 0.00001. Environment can change that, however. For example, radiation might cause the mutation rate to be closer to 0.01. Note also that the mutation rate does not need to be the same in each generation.
* **Number of generations in the simulation**
* **Inbreeding:** Notice that this can be manipulated
* **What you measure:** Note that you can look at the final frequency of each allele and/or the frequency of different genotypes at the end of the simulation. Your findings may include final frequencies, or how variable the results were from trial to trial, or how many generations it took before an allele became fixed, or at what point one parameter overwhelmed the effect of another parameter, etc. It really depends on what you decided to investigate.

**Procedure**

In your lab notebook, make careful notes about what questions you are investigating, what parameters you used (indicate all of your settings!), and what you find in your investigation. You should write down conclusions that you reach based on the results of the simulations. Refer to actual data when you formulate your conclusions. Depending on your investigation, graph your results to communicate your findings clearly. Make sure that what you put in your lab notebook is clear. Record what you did, what your results were, what you conclude, and make good notes as to why you think you got the results that you did. You will be turning in a report with the questions neatly answered.

**STUDENT LAB SHEET**: \**YOU MAY EDIT THIS DOCUMENT TO PASTE YOUR GRAPH(S)*

Name: Block: #:

**Investigation Question**:

**Outline of Procedure** (include parameters):

**Data:**

**Tables and Graphs**: \*You may copy and paste your graph (below), however you must clearly indicate all components of the graph(s), including a key.

**Analysis and Conclusions of Data**: (paragraph form)