

Virtual Genetics Lab (VGL) – General Instructions

Objective

To use your knowledge of genetics to design and interpret crosses to figure out which allele of a gene has a dominant phenotype and which has a recessive phenotype. This simulates a real lab in that there is no way to see if you've got the answer right. You will have to convince yourselves when you've done enough experiments to be sure.

Description

VGL is a computer simulation of the genetics of an imaginary insect. The computer randomly picks a character with two traits. It then randomly chooses which form of the character will be dominant and which will be recessive. That way, each time you start the program, you get a different problem (also, every group will get a different problem). Finally, it creates a population of insects with random genotypes called the Field Population.

As in a real genetics lab, the insects are kept in cages; Cage 1 contains the Field Population. You can select any two insects (one must be male and the other female) and cross them; the computer automatically puts their offspring in a new cage.

The tasks:

To solve different problems generated by VGL following Dr. G's specific instructions. A solution is a genetic model that accounts for all your data. This will be an introduction to hypothesis testing. Here, the hypotheses are your genetic models, the experiments are the crosses you do, the results are the offspring the crosses generate, and the conclusions are the model you finally choose as the correct one. For each problem you will submit a word document where you have detailed your reasoning, and a grading file from the program.

Starting up VGL:

1) You will work in groups of two to three people per computer (but you can work alone, and a group of 4 will be tolerated, but, graded more rigorously). You may want to take turns using the computer. It is easy to fill the screen with cages of creatures and get totally confused so you should work slowly and deliberately and keep careful notes about the experiments you do and the contents of each cage. If you get very confused, you can quit the program and start fresh with a new problem.

2) The program requires Java to run, and you may have to install that as well. It will guide you. You can run the program on your home computer (Mac or PC); it can be found at <http://vgl.umb.edu/index.htm> The windows version is in the shared folder, and there is a link at <http://mdgottfried.net>

3) To run the VGL program: double-click the VGLII icon in the folder-the icon looks like a little bug.

4) If you want to read the manual, click on the VGL Help bookmark at the top of the Welcome page. Note that the manual describes some features present in the version of VGL that you will not be using until later, in future assignments, if at all. In this version the image of the “bug” is not always in the box, but you can select it to see what it might look like.

5) Click on "New Problem" to begin. Each time you start a new problem, the computer will choose a new set of traits and characters as well as the underlying genetic model. Note that a character with the same name may have different properties in a different problem.





Once you click "New Problem", a window will appear for you to select the problem you will work on. What problem you select will depend on the specific instructions for the assignment.

6) Note-These instructions were based on an earlier version and there may be some differences. Work through them!

7) A cage will appear holding the “Field Population”. It will look something like this:

The screenshot shows a window titled "Cage 1" with a table of "Individual Animals". The table has columns for "Number", "Bodycolor", and "Phenotype". There are two rows of animals: green and blue. Red arrows point to the individual animal icons with the text "Click on individual creatures to select them for crossing." Another red arrow points to the "Number" column with the text "These are the numbers of each type of creature." A third red arrow points to the "Phenotype" column with the text "These pictures illustrate the particular phenotype; click on them to see a bigger picture." On the left, green text says "All the creatures in this box have Green Bodies." with a green arrow pointing to the green animal icons. Blue text says "All the creatures in this box have Blue Bodies." with a blue arrow pointing to the blue animal icons.



	Individual Animals	Number	Bodycolor	Phenotype
All the creatures in this box have Green Bodies.	♂♂♂♂♂ ♀♀♀♀♀	Five green body males	5 ♂	green 
		Five green body females	5 ♀	
All the creatures in this box have Blue Bodies.	♂♂♂♂♂♂♂♂♂ ♀♀	Nine blue body males	9 ♂	blue 
		Two blue body females	2 ♀	

In your case, the phenotypes involved will likely be different. Your task will be to interpret the genetic relationship following the specifics of the assignment. You will determine this by designing crosses and analyzing the resulting offspring.

8) Begin your experiments. Select a male and a female fly to be the parents: click on one parent then click on the other parent. One parent must be male and the other female but they may come from different cages. Note that you can cross a given fly more than once.

To cross (also known as “mate”) the selected flies, click the "Cross" button at the top of the VGL window. A cage will appear with the resulting offspring. A typical result is shown below:



Individual Animals		Number	Bodycolor	Phenotype
♂♂♂♂♂♂♂♂♂♂♂♂♀♀♀♀♀♀♀♀	These are the offspring of the parents selected in Cage 2.	10 ♂	green	
		7 ♀		
♂♂♀		2 ♂	blue	
		1 ♀		
Parent ♂ (2) green ♀ (2) green				

The information in this window could also be presented in words:

“A male with a green body from Cage 2 (this is a translation of: “♂ (2) green”) was crossed with a female with a green body from Cage 2 (this is a translation of: “♀ (2) green”)

This cross resulted in 20 (= 10+ 7 + 2 + 1) offspring:
 10 males with green body
 7 females with green body
 2 males with blue body
 1 female with blue body”

9) Continue crossing as needed; the objective is to make a genetic model to explain the inheritance of the traits you are studying. You decide whether you’re convinced or not; if not, keep crossing until you are. A complete model would look like:

“The color of the body is controlled by one gene with two alleles:

<u>allele</u>	<u>contribution to phenotype</u>
G	green body (dominant)
g	blue body (recessive)

10) Some of the models are practice models, and once you and your partner(s) are convinced of your model, you can check to see if you are right. Click on Cage 1 to bring it to the front of the screen. Click on the button marked “Show Model and Genotypes”. The window will expand to show the genetic model underlying the trait you are studying.

11) When you are done with this problem, click the “Close Work” button at the top of the VGL window. When it asks if you want to save your work, click “Don’t



save”.

Each of Dr.G’s assignments has you work through one practice problem and at least one problem that you can’t cheat on. You are only graded on your work on the “real” problems.

If you are correct you will get a good grade. If not, you can get partial credit ONLY if you also submit the word document with your thought processes. You should take careful notes about which flies were crossed and what the results were.

Quit VGL by clicking the box in the upper right corner of the window; you do not need to save your work.