Genetics II

In this lab, we will work with more advanced genetics problems to help you learn to apply what we've been talking about in lecture and the SPOC.

We will start with some pencil-and-paper problems to introduce a systematic way to approach genetics problems and then use jsVGL (Virtual Genetics Lab) as another way to explore these issues.

We will work on any problems we do not get to in this week's session next week.

First: Notebook Review
To be sure that you have all the information you need for this lab, with your lab partners, go over the notes you took while doing the SPOC and from lecture and be sure you have the information listed below. You should fill in any gaps in your notes so everyone in your group has all they need. You can check these items off as you go.

- For each of these modes of inheritance:
  - How are they different?
  - How do you write proper symbols for them?
  - How would you recognize them in cross results?
- The modes of inheritance are:
  - How the alleles interact:
    - Simple dominance
    - Incomplete dominance
    - Co-dominance
  - Where the alleles are found on chromosomes:
    - Autosomal
    - XX/XY sex-linked
    - ZZ/ZW sex-linked

You will then discuss these with your TA as a class to clarify any issues that remain.

(1) Consider the flower color in a hypothetical plant. Make a genetic model that fits the following data and give the genotypes of the different groups of individuals.

Cross 1: Blue-flowered plant **X** white-flowered plant

gives F_1: all pale-blue-flowered

Cross 2: Pale-blue F_1 **X** pale-blue F_1

gives F_2: 27 blue
49 pale-blue
24 white

allele contribution to phenotype

(2) Six, Five, and Two Antennae

The jsVGL problem "6, 5, & 2 Antennae" is also a case of incomplete dominance. Work with your classmates and your TA to arrive at a genetic model for this trait.

allele	contribution to phenotype

"Blue, Purple, & Yellow Eyes" is a similar problem if you'd like more practice. You can find more, randomly-generated, problems at the OLLM link "Extra practice with incomplete dominance".

Blood type in humans is controlled by one gene with 3 alleles. For Bio 111, you should use the following symbols when working blood-type problems in humans.

Allele	Contribution to phenotype
I^A	type A (co-dominant with I^B; dominant to i)
I^B	type B (co-dominant with I^A; dominant to i)
i	type O (recessive to all)

Complete the table below using this information:

Genotype	Phenotype
$I^A I^A$	
$I^B I^B$	
ii	
$I^A I^B$	
I^A i	
I^B i	

(3) Consider the following situation: a male (**George, type B blood**) and a female (**Sallie, type A blood**) claim that a newborn (**Fred, type B blood**) is their son.

a) Given this information, is it possible that George and Sallie are Fred's parents? (explain briefly)

b) You learn that George's father has type A blood and his mother has type B blood. Given this information, is it possible that George and Sallie are Fred's parents? (explain briefly)

c) On further investigation, you find that George's sister has type O blood. Given this information, is it possible that George and Sallie are Fred's parents? (explain briefly)

d) Finally, you discover that both of Sallie's parents are type AB. Given this information, is it possible that George and Sallie are Fred's parents? (explain briefly)

(4) Consider the following X-linked trait in a hypothetical mammal with XX/XY sex-determination where red eyes are dominant to white eyes.

allele	contribution to phenotype

Predict the expected offspring from the following crosses:

a) White-eyed female **X** red-eyed male.

b) Red-eyed female **X** white-eyed male (there are two possibilities here; give both).

(5) One and Six Antennae
Work with your TA and classmates to discover the genetic model underlying the traits in "1 & 6 Antennae"

allele	contribution to phenotype

The problem "Yellow and Purple Eyes" is similar, if you would like more practice. You can also go to the links in the OLLM to find related, randomly-generated, problems.

(6) Consider the following Z-linked trait in a hypothetical bird with ZZ/ZW sex determination where red eyes are dominant to white eyes.

Predict the expected offspring from the following crosses:

a) White-eyed female **X** red-eyed male (there are two possibilities here; give both).

b) Red-eyed female **X** white-eyed male.

(7) Blue and Green Legs
Work with your TA and classmates to discover the genetic model underlying the traits in "Blue & Green Legs"

allele	contribution to phenotype

The problem "Bent and Pointy Body" is similar, if you would like more practice. You can also go to the links in the OLLM to find related, randomly-generated, problems.

Preparing for the Take Home Exam

Take Home Exam 5 will be, in part, based on this lab. You should look at the exam on Blackboard before you leave lab today. You may want to use some of the remaining time in lab to prepare for the exam.

Bio 111 jsVGL Worksheet

Name_____ This is a group effort for a group grade. TA & Sect._____

Name_____

Name_____ Score_____/30

This is due at the end of lab today.

1) Click on any one of the "Extra Practice Problems" links from the OLLM to choose a type of problem to solve for this worksheet. Be sure to start a new Graded problem. Check off the link that you chose below:

- Extra Incomplete Dominance jsVGL Practice problems.
- Extra XX/XY Sex-linked or Autosomal Simple Dominance jsVGL Practice problems.
- Extra XX/XY, ZZ/ZW, or Autosomal Simple Dominance jsVGL Practice problems.

2) Solve the problem as you did in lab, by thinking carefully about what to cross, crossing organisms, and analyzing the results. Write out a genetic model that explains the inheritance you found in the table below: (5 pts)

Allele	Contribution to Phenotype

3) In jsVGL, using the Model Builder at the "Genetic Model" tab, enter your genetic model.

4) Choose one of the crosses that you performed that demonstrates an important part of your model and explain it below.

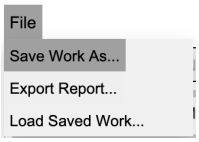
a) Give the Cage number_____

b) Give the parents' phenotypes and genotypes (using the symbols you defined in (2)). (4 pts)

Male Parent	X	Female Parent
Phenotype:_____		**Phenotype:**_____
Genotype:_____		**Genotype**:_____

c) Draw a Punnett Square for this cross showing the genotypes and phenotypes for the expected offspring. (8 pts)

5) Using the File->Save Work As… command (at right), save the jsVGL file and upload it using the appropriate Blackboard link on the page for this lab. Your TA will check off the items below when they grade your worksheet.



- .jsVGL file uploaded (2 pts)
- Genetic Model entered into Model Builder (2 pts)
- Genetic model is correct (8 pts)