COURSE: BIOL3001 GENETICS NAME: _____

LABORATORY 3, EXERCISE 3. ADVANCED MODES OF INHERITANCE

Purpose

Dichotomous Identification Keys are a mainstay of Biological investigations. These keys consist of a series of questions where the answers (often Yes / No) lead the user to a final identification. Below is an example of how you might identify potato chips.

A Simple Dichotomous Key: Example

1a. Plastic bag packaging	1b. Hard tube packaging
2a. Chips have ridged surface - **go to 3**	2a. Chips orange color
2b. Chips have non-ridged surface- **go to 4**	**= Pringles Cheddar Cheese**
	2b. Chips have other color-**go to 3**
3a. Chips orange color **= Ruffles BBQ**	
3b. Chips tan color **= Ruffles Original**	3a. Chips solid tan
	with no speckles **= Pringles Original**
4a. Orange color **= Lays BBQ**	3b. Chips tan w/ greenish speckles **= Lays**
4b. Tan color **= Lays Classic**	**Stax Sour Cream and Onion**

Now that you have derived clues for the 4 Modes of Inheritance discussed in the earlier exercise, you should be able to construct your own identification key. Below you are asked to develop a key and test it using a new set of 4 "unknown" mutants.

Exercise Protocol

Steps for this Exercise:

1. Construct a Dichotomous key that uniquely distinguishes each of the following Modes of Inheritance: Simple Mendelian Dominance/Recessive, Sex-Linkage, Incomplete/Codominance, Recessive Lethal. Think about what order in which you wish to develop your clues or statements. As an example, to start you off (*you do not have to start with this clue but you may if you wish*):

A. Results from a Reciprocal cross are the same.

1. IF YES, go to Step B.
2. IF NO, Mode of Inheritance is _____.

(also, include any other clues or characteristics that are relevant)

2. Be sure your Dichotomous key includes all of the following endpoints:

- Simple Mendelian Dominance/Recessive
- Sex-Linkage
- Incomplete/Codominance
- Recessive Lethal

Dichotomous Key

3. Obtain a NEW set of FOUR (4) traits. Make note of the set you choose; you will need to enter the traits individually in specific boxes on the following pages.

4. Note which traits you are examining:

SET 1 – ☐
Trait 1 - Eye color: White
Trait 2 - Body color: Platinum
Trait 3 - Eye shape: Lobe
Trait 4 - Wing shape: Dumpy

SET 2 – ☐
Trait 1 - Body color: Ebony
Trait 2 - Eye color: Scarlet
Trait 3 - Bristle: Sternopleural
Trait 4 - Wing shape: Surf

SET 3 – ☐
Trait 1 - Body color: Tan
Trait 2 - Eye color: Cinnabar
Trait 3 - Eye shape: Lobe
Trait 4 - Wing shape: Surf

SET 4 – ☐
Trait 1 - Body color: Ebony
Trait 2 - Eye color: Bar
Trait 3 - Bristle: Spineless
Trait 4 - Wing shape: Dumpy

5. Launch the Fly Lab Colony (https://cws.auburn.edu/FlyLab) and open an Advanced Cross to test crosses using the assigned traits above through the F2 Generation.

6. Record the results on the data sheet for LABORATORY EXERCISE 2. (*JUST A HINT, while all of the Data Sheets will have the same fillable fields, you MAY NOT have to fill all of them in!! This will be dependent on your Mode of Inheritance for your given trait. You also MAY NOT have to use all of the provided Data Sheets before determining your MOI. You will have to defend your answers at the end of the exercise however!*) Look carefully at the results of each step of your crosses. Use the Dichotomous key you developed to interpret the data obtained from the Fly Lab crosses.

7. Determine the Modes of Inheritance for each trait. Keep in mind this is one of those exercises where you "have to show your work"! Support how you developed each MOI.

GENETIC CROSS

LAB 3 EXERCISE 3 - DATA SHEET

NAME:

TRAIT 1:

CROSS DIAGRAM

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

RECIPROCAL CROSS DIAGRAM (*if needed*)

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

Chi-Squared Test

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

Chi-Squared Test (*Reciprocal Cross if needed*)

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

What is your final conclusion on the Mode of Inheritance for this particular trait? Why? How did you make this determination based on your Dichotomous key.

GENETIC CROSS

LAB 3 EXERCISE 3 - DATA SHEET

NAME:

TRAIT 2:

CROSS DIAGRAM

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

RECIPROCAL CROSS DIAGRAM (*if needed*)

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

Chi-Squared Test

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

Chi-Squared Test (*Reciprocal Cross if needed*)

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

What is your final conclusion on the Mode of Inheritance for this particular trait? Why? How did you make this determination based on your Dichotomous key.

LAB 3 EXERCISE 3 - DATA SHEET

NAME:

TRAIT 3:

CROSS DIAGRAM

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

RECIPROCAL CROSS DIAGRAM (*if needed*)

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

Chi-Squared Test

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

Chi-Squared Test (*Reciprocal Cross if needed*)

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

What is your final conclusion on the Mode of Inheritance for this particular trait? Why? How did you make this determination based on your Dichotomous key.

LAB 3 EXERCISE 3 - DATA SHEET

NAME:

TRAIT 4:

CROSS DIAGRAM

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

RECIPROCAL CROSS DIAGRAM (*if needed*)

Parentals	**Male**		**Female**
Phenotype		**x**	
Genotype		**x**	

F1 Generation	**Total**	**Male**	**Total**	**Female**
Phenotype				
Genotype				

F2 Generation

Total	**Sex**	**Phenotype**	**Genotype**

Chi-Squared Test

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

Chi-Squared Test (*Reciprocal Cross if needed*)

Phenotype	Observed	Expected	O - E	$(O – E)^2$	$(O – E)^2 / E$
TOTAL					

Observed Chi – Squared Value =

Degrees of Freedom (*df*) =

Table Value (0.05) =

Overall Conclusion = --

What is your final conclusion on the Mode of Inheritance for this particular trait? Why? How did you make this determination based on your Dichotomous key.