

LABORATORY 3, EXERCISE 2. ADVANCED MODES OF INHERITANCE

Purpose

In this exercise, you will use the Fly Colony online to determine the Modes of Inheritance for four (4) traits you will be assigned. You will develop a list of “clues” to help you identify the different possible modes of inheritance you could see in your results.

Exercise Protocol

Your assignment is:

1. To diagram and TEST crosses (Parental, F1 and F2 Generations) showing the different expected outcomes of phenotypes produced by one of the four Modes of Inheritance given below.
2. Determine the Modes of Inheritance for ALL the traits you are assigned.
3. Develop a list of CLUES to help you recognize specific Modes of Inheritance.

Steps for this Exercise:

1. You will need to select a set of traits for this for this exercise. Make note of the set you choose; you will need to enter the traits individually in specific boxes on the following pages.
2. Note which traits you are examining:

SET 1 –	Trait 1 - Eye color: Sepia Trait 2 - Body color: Ebony Trait 3 - Bristle: Stiff Trait 4 - Wing shape: Surf	SET 2 –	Trait 1 - Eye color: Black Trait 2 - Body color: Cinnabar Trait 3 - Bristle: Forked Trait 4 - Eye shape: Star
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3. 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.
4. 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. Look for SPECIFIC CLUES to help identify the Mode of Inheritance exhibited by each trait. Major things to look at and think about:
 - a. Do the offspring look like either parent?
 - b. Are the numbers of males and females equal for each phenotype?
 - c. Are both the mutant and Wild phenotypes present?
 - d. Did any new phenotypes appear?
 - e. What ratios do the phenotypes appear to exhibit?
5. Consider your observations regarding these crosses and answer the questions following each mutant.

LAB 3 EXERCISE 2 - DATA SHEET

TRAIT 1:

Parentals

Female

X

X

Total**Total**

Female

Genotype

Total

Sex

Phenotype

Genotype

Parentals

Female

X

X

Total

Male

Total

Female

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

=

CONCLUSIONS:

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

=

CONCLUSIONS:

What is your final conclusion on the Mode of Inheritance for this particular trait? Why?

LAB 3 EXERCISE 2 - DATA SHEET

TRAIT 2:

Parentals

Male

Female

Phenotype

X

Genotype

X

Total

Male

Total

Female

Phenotype

Genotype

Total

Sex

Phenotype

Genotype

Parentals

Male

Female

Phenotype

X

Genotype

X

Total

Male

Total

Female

Phenotype

Genotype

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

=

CONCLUSIONS:

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

=

CONCLUSIONS:

What is your final conclusion on the Mode of Inheritance for this particular trait? Why?

NAME:

TRAIT 3:

Parentals

Male

Female

Phenotype

X

Genotype

x

Total

Male

Total

Female

Phenotype

Genotype

Total

Sex

Phenotype

Genotype

Parentals

Male

Female

Phenotype

X

Genotype

X

Total

Male

Total

Female

Phenotype

Genotype

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

=

CONCLUSIONS:**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

=

CONCLUSIONS:

What is your final conclusion on the Mode of Inheritance for this particular trait? Why?

NAME:

TRAIT 4:

Parentals	Male		Female
Phenotype		x	
Genotype		x	

F1 Generation	Total	Male	Total	Female
Phenotype				
Genotype				

[illegible]

Parentals	Male		Female
Phenotype		x	
Genotype		x	

F1 Generation	Total	Male	Total	Female
Phenotype				
Genotype				

[illegible]

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

=

CONCLUSIONS:**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

=

CONCLUSIONS:

What is your final conclusion on the Mode of Inheritance for this particular trait? Why?

Develop a list of CLUES to recognize each Mode of Inheritance listed below. Things to recognize and possibly address: What phenotypes are present in the F1 Generation? What phenotypes are present in the F2 Generation? What is the final Segregation Ratio in the F2 Generation? How do your observed phenotypes relate to the observed genotypes? Does sex play a role in the inheritance?

SIMPLE MENDELIAN DOMINANCE

SEX LINKAGE

INCOMPLETE DOMINANCE (or CO-DOMINANCE)

RECESSIVE LETHAL