ASSIGNMENT # 6

DEADLINE: RETURN AT THE END OF THE LABORATORY SESSION

OPTION 1: Deposit a physical copy in the cart (front of the lab)

OPTION 2: Submit an electronic copy (i.e., PDF file) through the LMS platform (Canvas)

NAME: _____ **STUDENT #:** _____ **DATE:** _____

IN-PERSON LABORATORY ANALYSES: THIN LAYER CHROMATOGRAPHY (TLC)
WORTH 30% OF ASSIGNMENT GRADE (Q#1-3)

1. Did you (and your group) obtain visible pigments in the chromatography plate?

Yes: _____ No: _____ Potential reason: _____

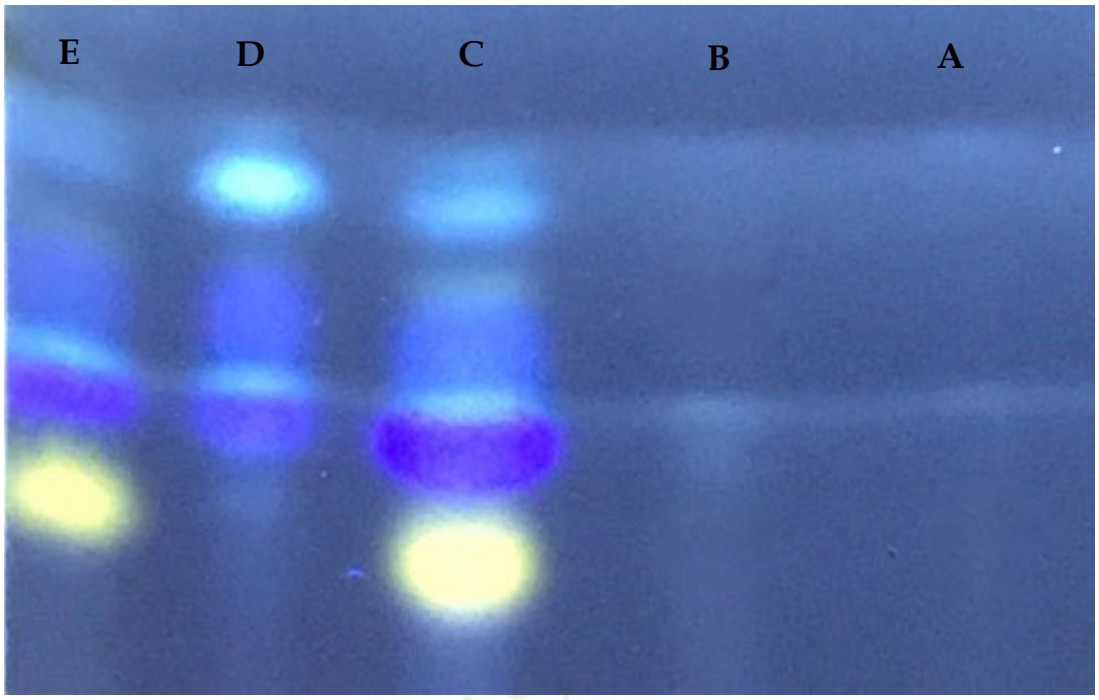
_____

Based on the observed patterns of pigment migration, can you distinguish between **wild-type** and **scarlet flies**? Explain.

2. Between **brown** and **white-eyed** flies? Explain.

3. Between **sepia** and **scarlet** flies? Explain.

4. The biol226 students (Winter-2026) performed a TLC of *Drosophila* eye pigments in the lab. Based on the following **picture under UV light**, please provide the possible phenotypes of the different flies.



A: _____ B: _____

C: _____ D: _____

E: _____

TESTING MENDELIAN INHERITANCE USING SIMULATED CROSSES

In the following exercises, you will generate **observed** dihybrid (**AaBb x AaBb**) and test-cross (**AaBb x aabb**) data from several organisms. Then, you will perform a X^2 to test a hypothesis (i.e. Independent assortment). **Each student will receive unique sets of data**.

5. Open the "**Dihybrid cross and X2 test**" tool available in Canvas or here: www.ampossot.com/dix2 . Click on "**Generate Dihybrid Cross Dataset**" to obtain the observed offspring numbers from a **AaBb x AaBb** cross (dihybrid). Complete the following information:

Organism: _____

Total number of offspring: _____

Phenotypes	Observed number

6. Calculate the **expected number** of offspring. Remember the expected phenotypic ratio (i.e., 9:3:3:1) for a dihybrid cross.

Phenotypes	Expected number

7. Run a χ^2 to test your hypothesis (**independent assortment**).

H_0: _____

8. X^2 Results. Please fill the table below.

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

X^2 Value: _____ Degrees of freedom: _____

p-value: _____

Conclusion:

9. Open the "**Test-Cross and X2 test**" tool available in Canvas (Lab#6) or here: www.ampossot.com/test. Click on "**Generate Test-Cross Dataset**" to obtain the observed offspring numbers from a **AaBb x aabb** cross. Complete the following information:

Organism: _____

Total number of offspring: _____

Parental phenotypic classes: _____

Phenotypes	Class (Par. Vs Rec.)	Observed number

10. Calculate the **expected number** of offspring. Remember the expected phenotypic ratio (i.e., 1:1:1:1) for a dihybrid cross.

Phenotypes	Expected number

11. Run a $\mathbf{X^2}$ to test your hypothesis (**independent assortment)**.

H_0: _____

X^2 Results

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

X^2 Value: _____ Degrees of freedom: _____

p-value: _____

Conclusion:

12. If there is evidence of potential gene-linkage, please use the **observed data** to calculate the recombination frequency. Show your work.

Recombination frequency: _____%

X^2 BASED ON COMPUTER SIMULATED DATA

Based on previous lab experiments and literature reports, it is known that the genes for body color, eye color and wing size are located on the **same chromosome** and the genetics model is known (**i.e., all three; yellow, white, and miniature are recessive mutations**). In the next exercise, you need to **1)** propose a hypothesis regarding the segregation of two genes and, **2)** test the hypothesis using the X^2 statistic.

Important: for this assignment, you will use the data from the "***Drosophila* Population Generator and χ^2 Test Simulator"** available on Canvas or here: www.ampossot.com/drosx2

All crosses performed at the Virtual Tools correspond to hypothetical simulated and randomized data. The actual genetics basis of the genes in nature may be different

13. Generate a **wild population** and use the table below to record the phenotype counts. **Note**: the order of the different phenotypes in the virtual tool may be different to the order on this template.

Scoring Table: Wild Population

Body Color	Eye Color	Wing Size	F	M	Total
Wild type	Wild type	Wild type			
Wild type	Wild type	Mini			
Wild type	White	Wild type			
Wild type	White	Mini			
Yellow	Wild type	Wild type			
Yellow	Wild type	Mini			
Yellow	White	Wild type			
Yellow	White	Mini			

14. Perform a trihybrid **test cross** between a **wild -type female fly** (heterozygote) and a **yellow body, white eyed, miniature male fly.** You can sort by **genotypes**, then, make sure that you are using the right flies in the cross (**Xy+w+m+ / Xywm** and **Xywm / Y**). Record the number of offspring in the scoring template.

Female #: _____ Male#: _____

Scoring Table: Vial #:_____					
Body Color	**Eye Color**	**Wing Size**	**F**	**M**	**Total**
Wild type	Wild type	Wild type			
Wild type	Wild type	Mini			
Wild type	White	Wild type			
Wild type	White	Mini			
Yellow	Wild type	Wild type			
Yellow	Wild type	Mini			
Yellow	White	Wild type			
Yellow	White	Mini			

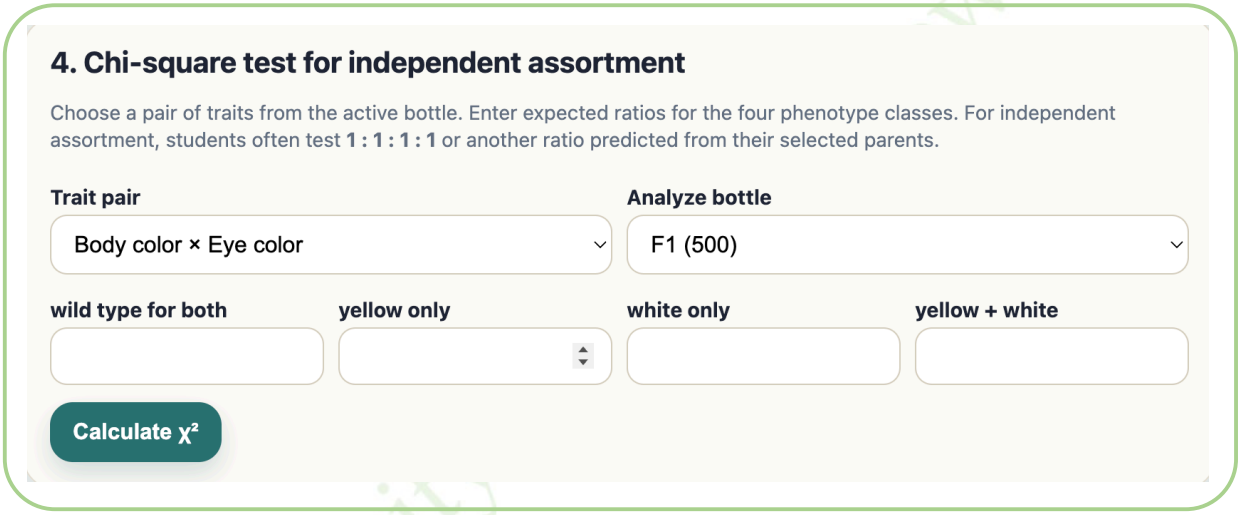
15. Consider only the **Body color** and **Eye color** genes. Provide the **expected** (under independent assortment) and **observed** phenotypic **ratios** (e.g., 1:1) resulting from the previous cross. Please **reduce the ratios to lowest terms** (e.g., 1.03 : 1)

Expected ratio		
Body Color	**Eye Color**	**Ratio**
Wild type	Wild type	
Wild type	White	
Yellow	Wild type	
Yellow	White	

Observed ratio		
Body Color	**Eye Color**	**Ratio**
Wild type	Wild type	
Wild type	White	
Yellow	Wild type	
Yellow	White	

16. Based on the previous cross, please provide a **null hypothesis** (H_0) assuming independent assortment of the **body and eye color genes**. (*For example*: "*If the yellow and white mutations are recessive, then, the expected segregation of a testcross would be….*").

17. Perform a X^2 test using the tool. To do so, select the **Body color and Eye color** genes. Enter the expected ratios and calculate the X^2. See the example below.



X^2 Calculated: _____

Degrees of freedom: _____ **p-value**: _____

State your conclusions:

***IMPORTANT NOTE*:**

Remember to return your assignment at the END of the lab session or to submit an electronic copy (i.e., scanned PDF file) through CANVAS