**ASSIGNMENT # 2****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 WORK AND IDENTIFICATION OF PHENOTYPES
WORTH 30% OF ASSIGNMENT GRADE (Q#1-2)**

1. After observing the **F₁** flies under the dissecting scope, please summarize the obtained data in the table below. **Please double check the phenotypes with your TA.** y=yellow, w=white, m=miniature, se=sepia, WT= wild-type. **NOTE:** To get full marks, please record your observed results in the electronic file available in the link in the Canvas modules (Lab # 2).

	Males			Females			Total
	y-w-m	se	WT	y-w-m	se	WT	
Total							

Is there any **major difference (i.e., bias)** between the phenotype of male vs. female flies?
For example: All males are mutants (none are wild-type); All females are wild-type (none are mutants)
This may be considered evidence of the presence of sex-linkage

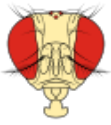
YES: _____ NO: _____

2. Based on your analysis of the obtained **F₁ data**, please propose the mode of inheritance of the different mutations. **HINT:** Consider the phenotype of the **P₁** and **P₂** flies. Then, carefully analyze the segregation of the traits in the **F₁** flies.

**P1 Female:** yellow body, white eyes, miniature wing**X****P2 Male:** Sepia eyes (wild type for the other traits)

F1 males phenotype: _____

F1 females phenotype: _____

**RAPID TEST: MAKE PREDICTIONS USING A PROPOSED MODEL**

3. Assume that the yellow body, white eyes and miniature wings are recessive and sex-linked mutations. The sepia eye color mutation is an autosomal and recessive mutation. Please provide the **genotype** of the **P₁** yellow body, white eyes, miniature wing females and **P₂** sepia-eyed males (both are homozygous). Use the notation for *Drosophila* research (pages 11-12).

P₁ yellow, white, mini females: _____

P₂ sepia-eyed males: _____

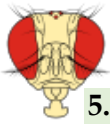
4. Please provide the **expected** phenotype and genotype of the **F₁** flies. Show your work.

P₁: y-w-m females: _____ X **P₂**: sepia males: _____

Gametes		

F₁ genotype(s): _____

F₁ phenotypes(s): _____



5. Do these **expected** results (question # 4) correspond with the **observed** data (question # 1)?

YES: ____ NO: ____

Please provide a brief explanation:

GENETICS PROBLEM: IMPROVE YOUR SOLVING SKILLS

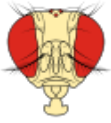
In *Drosophila melanogaster*, **Curly** is **dominant** over **normal** wings (wild type) and **brownish** body color (wild type) is **dominant** over **ebony** body color (black). **Assume** that both genes are located on **different autosomes**. The following cross between two pure lines (i.e., **homozygous**) is performed:

P₁: females, Curly wings

x

P₂: males, ebony body color



**Answer the following questions:**

6. Based on the **genetics notation used in *Drosophila***, please provide the genotypes of **P₁ Curly-wing females** and **P₂ ebony body males**.

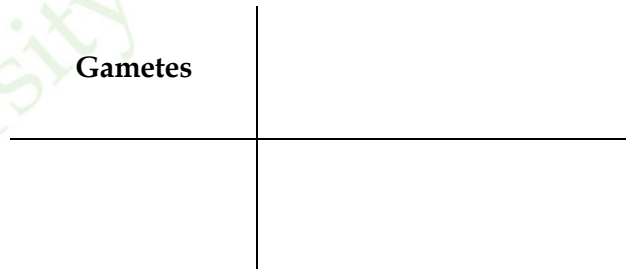
Hint: For the notation, please consider the following information: **females** carry the **Curly mutation (Cy)** and the wild type allele for body color (**b⁺**). The **males** carry the **ebony mutation (b)** and the wild type allele for wing shape (**Cy⁺**)

P₁ Curly-wing females: _____ **P₁ Gametes:** _____

P₂ ebony body males: _____ **P₂ Gametes:** _____

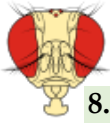
7. Based on your answer to the previous question, please provide the expected **phenotype** and **genotype** of the **F₁** flies.

Make a Punnet square if you need it:



Phenotype: _____

Genotype: _____



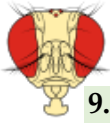
8. What are the F₂ **phenotypic proportions** (Ex. 9/16) expected by crossing the F₁ males and females? Show your work using the Punnet square template.

F₁ genotype: _____ X F₁ genotype: _____

Gametes				

Phenotypic proportions:

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9. In *Drosophila melanogaster*, **Bar-shaped** eyes are **dominant** to **normal** eyes (the most common phenotype is normal). Assume that this is an **autosomal** gene and use the *Drosophila* **genetics notation**.

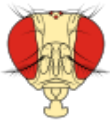
- How would you designate the genotype of a **homozygous** Bar-eyed fly? _____

- How would you designate the genotype of a **normal**-eye fly? _____

- What is the phenotype of a **heterozygous** fly? _____

- What is the result of a cross between a **heterozygous** Bar-eyed fly to a **normal**-eyed fly?. Show your work using a Punnet square.

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**GENETICS VIRTUAL LAB**

For the next set of questions, you will use the **“Dihybrid Inheritance Analyzer”** tool available online (www.ampossot.com/dihybrid).

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

To describe the phenotypes, **reduce the ratio to its lowest terms** (Ex., 3.1:1)

Based on the simulation of several crosses (dihybrid), you need to determine the **genetics model** of **two traits** (I.e., Dominant vs. Recessive; Autosomal vs. Sex-linked). Perform the following crosses using the virtual tool and fill the tables with the required information.

Hint: When you are studying a cross that includes several traits, start your analysis with **one trait at a time**. For example, start by crossing two flies with the same wing shape **without** considering the body color.

10. Wing shape: perform **three** independent crosses between a **wild-type female** and a **wild-type male**. Record the data in the scoring tables. The number of obtained flies is available in the “show details” tab of each corresponding vial.

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males Curly (none wild-type); All females wild-type (none Curly).

This may be considered evidence of the presence of sex-linkage



11. Wing shape: perform three independent crosses between a wild-type female and a Curly-winged male. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____					Vial #: _____					Vial #: _____									
Wing Shape	Body Color	F	M	Total	Wing Shape	Body Color	F	M	Total	Wing Shape	Body Color	F	M	Total					
Curly	Ebony				Curly	Ebony				Curly	Ebony								
Curly	Wild type				Curly	Wild type				Curly	Wild type								
Wild type	Ebony				Wild type	Ebony				Wild type	Ebony								
Wild type	Wild type				Wild type	Wild type				Wild type	Wild type								
Phenotypic Ratio					Phenotypic Ratio					Phenotypic Ratio									
Wild Type:					Curly:					Wild Type:					Curly:				

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males Curly (none wild-type); All females wild-type (none Curly).

This may be considered evidence of the presence of sex-linkage

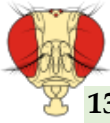
12. Wing shape: perform three independent crosses between a Curly-winged female and a wild-type male. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____					Vial #: _____					Vial #: _____									
Wing Shape	Body Color	F	M	Total	Wing Shape	Body Color	F	M	Total	Wing Shape	Body Color	F	M	Total					
Curly	Ebony				Curly	Ebony				Curly	Ebony								
Curly	Wild type				Curly	Wild type				Curly	Wild type								
Wild type	Ebony				Wild type	Ebony				Wild type	Ebony								
Wild type	Wild type				Wild type	Wild type				Wild type	Wild type								
Phenotypic Ratio					Phenotypic Ratio					Phenotypic Ratio									
Wild Type:					Curly:					Wild Type:					Curly:				

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males Curly (none wild-type); All females wild-type (none Curly).

*This may be considered evidence of the presence of sex-linkage**



13. **Wing shape:** perform **three** independent crosses between a **Curly-winged female** and a **Curly-winged male**. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Vial #: _____

Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Curly:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males Curly (none wild-type); All females wild-type (none Curly).

This may be considered evidence of the presence of sex-linkage

14. Based on your analysis of the previous twelve crosses, propose a **genetics model of inheritance** for the **wing shape trait**:

Can you **determined** the mode of inheritance using the collected data: YES: _____ NO: _____

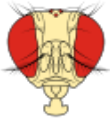
If your answer is "**NO**", try re-running the virtual tool until you have data that supports your conclusions.

Wild-type wing is: **Dominant:** _____ **Recessive:** _____

Curly wing shape is: **Dominant:** _____ **Recessive:** _____

The wing shape gene (trait) is: **Autosomal:** _____ **Sex-linked:** _____

Does the genetics model of the **simulation** correspond to that of question # 6?. Please explain



In the following section, you will focus on the analysis of the **second trait (body color)**.

15. Body color: perform **three** independent crosses between a **wild-type female** and a **wild-type male**. Record the data in the scoring tables. The number of obtained flies is available in the “show details” tab of each corresponding vial.

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males ebony (none wild-type); All females wild-type (none ebony).

This may be considered evidence of the presence of sex-linkage

16. Body color: perform **three** independent crosses between a **wild-type female** and an **ebony body male**. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

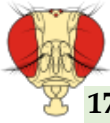
Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males ebony (none wild-type); All females wild-type (none ebony).

This may be considered evidence of the presence of sex-linkage



17. **Body color:** perform **three** independent crosses between an **ebony body female** and a **wild-type male**. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males ebony (none wild-type); All females wild-type (none ebony).

This may be considered evidence of the presence of sex-linkage

18. **Body color:** perform **three** independent crosses between an **ebony body female** and an **ebony body male**. Record the data in the scoring tables. Make sure that you use different parental flies each time you perform a cross.

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

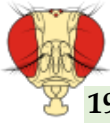
Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Vial #: _____				
Wing Shape	Body Color	F	M	Total
Curly	Ebony			
Curly	Wild type			
Wild type	Ebony			
Wild type	Wild type			
Phenotypic Ratio				
Wild Type:		Ebony:		

Is there any **major difference (i.e. bias)** between the phenotype numbers of male vs. female flies? _____

For example: All males ebony (none wild-type); All females wild-type (none ebony).

This may be considered evidence of the presence of sex-linkage



19. Based on your analysis of the previous twelve crosses, propose a **genetics model of inheritance** for the **body color trait**:

Can you **determine** the mode of inheritance using the collected data: YES: _____ NO: _____

If your answer is "**NO**", try re-running the virtual tool until you have data that supports your conclusions.

Wild-type body color is: **Dominant:** _____ **Recessive:** _____

Ebony body color is: **Dominant:** _____ **Recessive:** _____

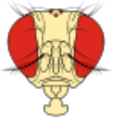
The body color gene (trait) is: **Autosomal:** _____ **Sex-linked:** _____

Does the genetics model of the **simulation** correspond to that of question # 6?. Please explain

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***IMPORTANT NOTE*:**

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



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