**ASSIGNMENT # 5****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)**

1. After observing the  $F_2$  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.

Phenotype	Sex	Amount	Total
WT	F		
	M		
y, w, m	F		
	M		
y	F		
	M		
w, m	F		
	M		
y, w	F		
	M		
m	F		
	M		
w	F		
	M		
y, m	F		
	M		
se	F		
	M		
y, se	F		
	M		
m, se	F		
	M		
y, m, se	F		
	M		



Did you (with your group) perform the pigment extraction and set up the chromatography plate?

Yes: \_\_\_\_\_ No: \_\_\_\_\_ Reason: \_\_\_\_\_

### UNDERSTANDING THE CONCEPTS: GENETICS VIRTUAL LAB

2. For the next set of question, you will use the “[Pigment Pathway Simulator](#)” tool available on Canvas or here: [www.ampossot.com/pigments](http://www.ampossot.com/pigments) . Create the following genotypes in the simulator and complete the table.

Genotype	Eye color phenotype	Pteridines present?	Ommochrome present?	Drosopterin present?
$Xw+/Xw+; bw+/bw+; st+/st+; se+/se+$				
$Xw/Xw; bw+/bw+; st+/st+; se+/se+$				
$Xw+/Xw+; bw/bw; st+/st+; se+/se+$				
$Xw+/Xw+; bw+/bw+; st/st; se+/se+$				
$Xw+/Xw+; bw+/bw+; st+/st+; se/se$				

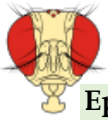
### Answer the following questions:

3. Which mutant lacks both pteridines and ommochrome pigments?

4. Which mutation affects only the pteridine pathway?

5. Which mutation affects only the ommochrome pathway?

6. Why does the sepia mutant still produce visible eye pigments?



**Epistasis.** The white gene encodes a transporter subunit required for both pathways. Construct the following genotype in the virtual tool and answer the questions.

$Xw/Y ; bw/bw ; st/st ; se/se$

7. What is the phenotype of the fly?

8. Explain why mutations in brown, scarlet, and sepia are not visible in this background.

9. Is the white gene epistatic to brown and scarlet? Support your answer using evidence from the pathway.

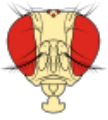
10. Define epistasis in your own words.

For questions 11 -12, construct the following genotype:  $Xw+/Y ; bw/bw ; st/st ; se+/se+$  and answer the questions

11. What is the phenotype of the fly?

12. If the white gene has a functional allele, explain the absence of pigments in the TLC plate.

13. Do WT and Scarlet flies show different pigment patterns in the TLC plate? Explain.

**GENETICS PROBLEM: IMPROVE YOUR SOLVING SKILLS**

Please consider the following information to solve the following genetics problem

In *Drosophila*, the gene for **white** (**w**) eyes is on the X chromosome and it is **epistatic** over **brown** (**bw**) and **scarlet** (**st**) (both located on different autosomes). White, brown, and scarlet are **recessive** mutations.

The white eyes phenotype can also result **when both mutant alleles are present: bw/bw; st/st**.

A cross is made between homozygous lines of **white-eyed females** with the genotype **Xw/Xw** (otherwise, homozygous for wild type alleles) and **white-eyed males** hemizygous for the **wild** type allele (**Xw<sup>+</sup>/Y**).

4. Using the **genetics notation for *Drosophila* research**, please provide the genotypes of the P<sub>1</sub> and P<sub>2</sub> flies.

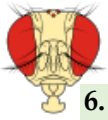
P<sub>1</sub> white females: \_\_\_\_\_ X P<sub>2</sub> white males \_\_\_\_\_

5. Using the ***Drosophila* genetics notation**, please provide the genotype and phenotype of the F<sub>1</sub> flies. Show your work

Gametes		

F<sub>1</sub> females: Genotype: \_\_\_\_\_ Phenotype: \_\_\_\_\_

F<sub>1</sub> males: Genotype: \_\_\_\_\_ Phenotype: \_\_\_\_\_



6. Please provide the expected  $F_2$  **phenotypic** proportions (i.e.  $\frac{3}{4}$ ). Show your work. **Hint:** It could be easier to perform the fork-line method when you have a tri-hybrid cross or try drafting individual-gene Punnet squares and use the probability rules.

$F_1$  females: \_\_\_\_\_ X  $F_1$  males: \_\_\_\_\_

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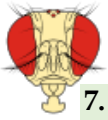
**Phenotypic proportions (reduce the fractions to lowest terms)**

Wild type: \_\_\_\_ / \_\_\_\_

Brown: \_\_\_\_ / \_\_\_\_

Scarlet: \_\_\_\_ / \_\_\_\_

White: \_\_\_\_ / \_\_\_\_



7. Please estimate the **probability** of obtaining the following type of flies in the  $F_2$  offspring. **Show your work.** Please **reduce the fractions to lowest terms.**

- Only white females

- Only brown males

- Scarlet or brown flies

- Wild type males or scarlet flies

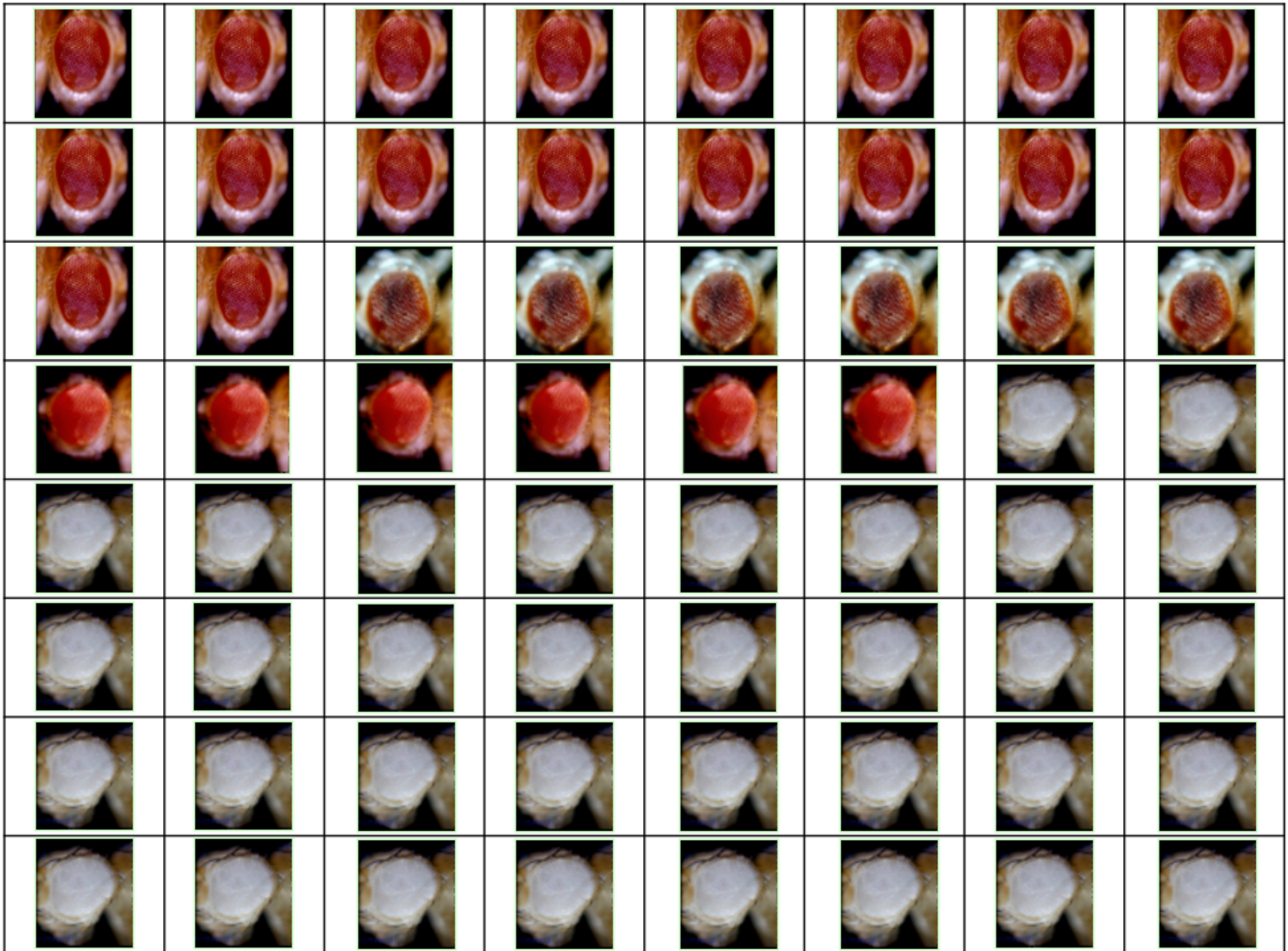
- Scarlet females or wild type males

- White or wild type flies

- Males brown or male scarlet flies



**HELP:** The following diagram represents the expected **phenotypes of the F<sub>2</sub> generation of question # 6**. It may be helpful counting individual flies in this diagram (total=64) and compare with your obtained proportions (ratios). These phenotypes were described in the introduction section of this lab (wild-type, brown, scarlet, white).



**\*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**