Name: _____
Hour: _____

Nature at Work

In this lab, you will investigate how natural selection can lead to changes in a species over time. You will explore how both genetic and environmental factors play a part in natural selection.

- **Problem**
  - How do species change over time?
- **Materials**
  - 50 "Mouse" Cards (Purple)
  - 25 "Event" Cards (Green)
  - Pen

Table 1: "Mouse" Cards

Number	Label	Meaning
25	W	Dominant allele for white fur
25	w	Recessive allele for brown fur

Table 2: "Event" Cards

Number	Label	Meaning
5	S	Mouse survives
1	D	Disease kills mouse
1	P	Predator kills mice of all colors
18	C	Predator kills mice that contrast with the environment

- **Procedure**
  - **Part 1: White Sand Environment**
    1. Count the mouse and event cards. Make sure you have 50 mouse cards and 25 event cards.
    2. Keeping the cards separate, mix up the mouse cards and mix up the event cards
    3. Choose two mouse cards. Allele pairs WW and Ww will produce a white mouse. Allele pair ww will produce a brown mouse. Record the color of the mouse with a tally mark in the data table on the next page.
    4. Choose an event card. An "S" card means the mouse survives. A "D" or a "P" card means the mouse dies. A "C" card means the mouse dies if its color contrasts with the white sand dunes **(only brown mice will die with a "C" card drawn.)**. Record each ***death*** with a tally mark in the data table.
    5. IF the mouse lives put the two mouse allele cards in a "live mice" pile. If the mouse dies, put the two mouse allele cards in a "dead mouse" pile. Put the event card at the bottom of its pack.
    6. Repeat steps 3-5 with the remaining mouse cards to study the first generation of mice. Continue recording your results.
    7. Leave the dead mice cards untouched. Mix up the cards from the live mice pile. Mix up the event cards.
    8. Repeat steps 3-7 for the second generation. Then repeat steps 3-6 for the third generation.

Part 1: White Sand Environment

Data Table: Part 1

Type of Environment: White Sand Environment							
Generation	**White Mice**		**Brown Mice**	**Total Living Mice**		**Deaths**	
	WW	**Ww**	**ww**	**White Mice**	**Brown Mice**	**White Mice Die**	**Brown Mice Die**
1							
2							
3							

Part 2: Forest Floor Environment

Make a prediction: How would the data differ if the mice in the previous environment lived on a dark brown forest floor?

_____

_____

- **Procedure**
  - **Part 2: Forest Floor Environment**
    1. Keeping the cards separate, mix up the mouse cards and mix up the event cards
    2. Choose two mouse cards. Allele pairs WW and Ww will produce a white mouse. Allele pair ww will produce a brown mouse. Record the color of the mouse with a tally mark in the data table on the next page.
    3. Choose an event card. An "S" card means the mouse survives. A "D" or a "P" card means the mouse dies. A "C" card means the mouse dies if its color contrasts with the forest floor **(only white mice will die with a "C" card drawn.)**. Record each ***death*** with a tally mark in the data table.
    4. IF the mouse lives put the two mouse allele cards in a "live mice" pile. If the mouse dies, put the two mouse allele cards in a "dead mouse" pile. Put the event card at the bottom of its pack.
    5. Repeat steps 2-4 with the remaining mouse cards to study the first generation of mice. Continue recording your results.
    6. Leave the dead mice cards untouched. Mix up the cards from the live mice pile. Mix up the event cards.
    7. Repeat steps 2-6 for the second generation. Then repeat steps 2-5 for the third generation.

Data Table: Part 2

Type of Environment: White Sand Environment							
Generation	**White Mice**		**Brown Mice**	**Total Living Mice**		**Deaths**	
	WW	**Ww**	**ww**	**White Mice**	**Brown Mice**	**White Mice Die**	**Brown Mice Die**
1							
2							
3							

Analyze and Conclude: Answer the following questions in complete sentences

1. For each generation in **Part 1**, which color mouse had the higher death rate? (HINT: To calculate death rate for mice: $\frac{total\ \#of\ dead\ white\ mice}{total\ \#\ of\ white\ mice} \times 100$, then do the same for brown mice. **SHOW YOUR WORK!**

Generation	Work		Answer	
	White Mice	Brown Mice	White Mice	Brown Mice
1				
2				
3				

   a. Which color mouse had the higher death rate? Explain why this happened.

_____

_____

2. If the events in Part 1 occurred in nature, how would the group of mice change over time?

_____

_____

3. Explain how the results in Part 2 differ from those in Part 1. **Why do you think this happened**?

_____

_____

4. In your **own words**, explain what natural selection is.

_____

_____

5. What are some ways this investigation models natural selection?

_____

_____

6. What are some ways you think natural selection would differ from this model?

_____

_____

7. Calculate the allelic frequency for each generation in part 1 and part 2 (HINT: to calculate allelic frequency $\frac{total\ \#of\ white\ or\ brown\ mice}{total\ \#\ of\ mice\ (white+brown)} \times 100$) **SHOW YOUR WORK**

Part 1

Generation	Work		Answer	
	White Mice	Brown Mice	White Mice	Brown Mice
1				
2				
3				

Part 2

Generation	Work		Answer	
	White Mice	Brown Mice	White Mice	Brown Mice
1				
2				
3				

8. How does this lab show that there has been a change in allele frequency?

_____

_____

9. Do individuals or populations evolve over time? Provide evidence and explain how you know this.

_____

_____