Name _____ Date _____
AP Biology Mr. Collea

Animal Behavior

Background Information

Drosophila melanogaster, the common fruit fly, is an organism that has been studied in the scientific community for more than a century. Thomas Hunt Morgan began using it for genetic studies in 1907. The common fruit fly lives throughout the world and feeds on fruit and the fungi growing on rotting fruit. It is a small fly, and one could question why scientists have spent so much time and effort on this tiny insect. It is about the size of President Roosevelt's nose on a dime, but despite its small size, the fly is packed with many interesting physical and behavioral characteristics. Its genome has been sequenced, its physical characteristics have been charted and mutated, its meiotic processes and development have been investigated, and its behavior has been the source of many experiments. Because of its scientific usefulness, Drosophila is a model research organism. Its genus name is based on observations about the fly; the fly follows **circadian rhythms** that include sleeping during the dark and emerging as an adult from a pupa in the early morning.

All living organisms must respond in to their environment. Animals that move can exhibit external behavior in response to stimuli. Responses can be **innate** (*genetic*) or **learned**. Innate responses include **kinesis** and **taxis**. **Kinesis** is a random movement that is elicited by a stimulus. For example, if you lift up a log in the forest, small animals like ants and pill bugs will respond by moving in a quick, random manner. A **taxis** is a response that is directional and involves movement. It can be **toward a stimulus** (*positive taxis*) or **away from** a stimulus (*negative taxis*). **Taxis** are animal behaviors while **tropisms** are plant responses (*ex. plant growing toward light*). Chemotaxis is a response to a chemical. Examples of taxis in fruit flies include:

- Adult fruit flies exhibit negative geotaxis and climb up their chambers against gravity.
- Adult fruit flies exhibit positive phototaxis and fly toward light.
- Larvae of fruit flies exhibit negative phototaxis and move away from light.
- Adult fruit flies exhibit positive chemotaxis and move toward rotting food (*attracted to favorable egg laying environments*).
- Adult fruit flies exhibit positive chemotaxis to ripe fruit and negative taxis to non-ripe fruit (*ripe fruit contains higher concentrations of sugars*).
- Adult fruit flies exhibit positive chemotaxis rotting fruit. This is because they are attracted to substances that offer food or an environment in which to lay their eggs and develop larvae.

In every ecosystem, organisms are influenced by **limiting factors**, which are **biotic** (*living*), or **abiotic** (*nonliving*) factors that regulate the maximum size of a given population and a relatively narrow range of environmental conditions that are favorable to them and their offspring. Since most organisms cannot change the nature of their environment, they must position themselves in an environment with favorable conditions. This behavior is called **habitat selection** and is what will be observed in this activity via the use of a choice chamber.

(1) **Predict** which type of environment the fruit flies will prefer: **WET** **DRY**

Justify your prediction:

_____

_____

_____

_____

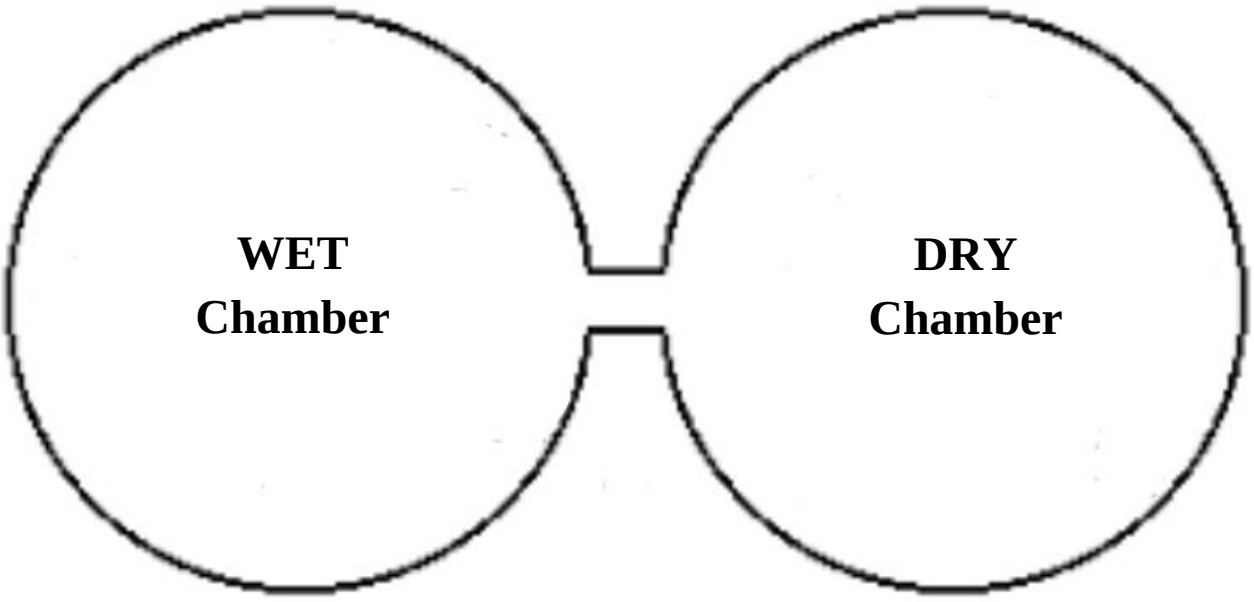
(2) **State** your Null Hypothesis (H_o):

_____

_____

_____

Methodology



Total Number of Flies: _____

Table 1. Individual Results

	Number of Flies	
Time (min)	Wet Chamber	Dry Chamber
0		
1.0		
2.0		
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		
10.0		
11.0		
12.0		
13.0		
14.0		
15.0		

Table 2: Distribution of Fruit Flies in Choice Chamber after 15 minutes

	Number of Flies	
	WET	DRY
Expected		
Observed		

(3) Construct a line graph with **# of fruit flies** on the **Y-axis** and **Time** (minutes) on the **X-axis**. Your graph will have **2 lines**, one for each treatment group. Include a **key** to identify which line is which. Make sure to give the graph a **title** and label both the X and the Y axis including units.

Title:_____

(4) What conclusions can you draw from your data and graph?

_____

_____

_____

_____

(5) Complete a Chi-Square analysis on your WET/DRY results to determine if the fruit flies actually prefer one environment over the other or if their movement was due to chance.

Chi-Square Table

p value	Degrees of Freedom							
	1	2	3	4	5	6	7	8
0.05	3.84	5.99	7.82	9.49	11.07	12.59	14.07	15.51
0.01	6.64	9.21	11.34	13.28	15.09	16.81	18.48	20.09

Table 3. Results

	Wet	**Dry**
Expected		
Observed		

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

(6) Degrees of freedom (n – 1) = _____

(7) Should you *accept* or *reject* the Null Hypothesis? _____

(8) State a conclusion for this experiment.

_____

_____

_____

_____

(8) Based on your answer to the previous question, can the movement of the fruit flies be classified as **kinesis** or **taxis**? **EXPLAIN.**

_____

_____

_____

_____