



New Jersey Center for Teaching and Learning

Progressive Science Initiative

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AP BIOLOGY



**Investigation #12
Fruit Fly Behavior**

Summer 2014

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Investigation #12: Fruit Fly Behavior

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- **Pacing/Teacher's Notes**
- **Pre-Lab**
- **Guided Investigation**
- **Independent Inquiry**

Pacing/Teacher's Notes

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Teacher's Notes

Lab procedure adapted from College Board AP Biology Investigative Labs: An Inquiry Approach Teacher's Manual

[Click here for CB AP Biology Teacher Manual](#)

Pacing

Day (time)	Activity	General Description	Reference to Unit Plan	Notes
Day 1 (HW)	Pre-lab	Pre-Lab questions	Eco Day 2 HW	
Day 2 (40)	Getting Started Steps 1-5	Observing and Sexing Flies	Eco Day 3	
Day 3 (80)	Independent Investigation	Place flies in choice chamber and observe behavior	Eco Day 4	
Day 4 (20)	Assessment	Lab Quiz	EC Day 5	

Pre-Lab

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Question/Objectives

What environmental factors trigger a fruit fly response?

In this lab we will:

- Investigate the relationship between a model organism, *Drosophila*, and its response to different environmental conditions.
- Design a controlled experiment to explore environmental factors that either attract or repel *Drosophila* in the laboratory setting.
- Analyze data collected in an experiment in order to identify possible patterns and relationships between environmental factors and a living organism.
- Work collaboratively with others in the design and analysis of a controlled experiment.
- Connect and apply concepts.

Pre-Lab Questions

Read the background information and answer the following questions in your lab notebook.

1. Sketch the life cycle of *Drosophila*.
2. Define taxis and give examples of environmental factors that might trigger this behavior.
3. Outline the sensory pathway involved in *Drosophila* behavior.

Safety

Do not add substances to the choice chamber unless your teacher has approved them.

If the substance you add is flammable, such as ethanol, use caution and do not conduct your experiment near a heat source or flame.

Many of the substances used in this experiment are food items, but you should not consume any of them.

Fruit flies are living organisms that should not be released to the environment. After all the investigation are complete, flies should be tapped into a "morgue" through a funnel. The morgue typically is a 150 mL beaker that contains about 50 mL of salad oil or 70% ethanol.

Guided Investigation

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Materials

- Fruit fly cultures
- Empty vials
- Petri dishes, empty bottles, or choice chambers
- Cotton balls
- Small paint brushes
- Funnel
- Laboratory notebook

Sexing & Observing Flies

Step 1 Look at the fruit flies in the figure below. Insure that you can correctly identify female and male fruit flies.



Sexing & Observing Flies

Step 2 Using fruit fly cultures, carefully toss 10 to 20 living flies into an empty vial. This can be done by tapping the culture vial on a solid surface to move the flies to the bottom of the vial. Quickly remove the foam or cotton top and invert the empty vial over the top of the culture vial. Invert the vials so that the culture vial on the top and the empty vial is on the bottom. Tap the flies into the empty container by tapping it on a solid surface. It is not necessary to isolate every fly from the culture vial. Be sure to plug the vial as soon as you add the flies and plug the culture vial.

Do not anesthetize the flies before this or any of the behavior experiments.

Sexing & Observing Flies

Step 3 After your lab group has the flies in a vial without food, observe the position of the flies in your upright vial.

Step 4 Invert the vial, and observe the position of the flies after 15 seconds and after 30 seconds.

Analyzing Results

Analysis Questions

- What was the flies' response?
 - Did most/all of the flies move in the same general direction?
- If so, this might be an "orientation movement", which is a movement that is in response to some stimulus.
- Based on how you manipulated the vial, to what stimulus might the flies be responding?

Independent Inquiry

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Designing & Conducting Your Investigation

Design an experiment using a choice chamber to compare the preferences of fruit flies to substances or the chemotactic responses of your flies. The following questions could be investigated, but you are not limited to these.

- Are all substances equally attractive or repellant to the fruit flies?
- Do preferred substances have any characteristic in common?
- What other factors might affect whether or not the fruit flies moved from one part of your choice chamber to the other?
- Do you think that it is the fruit itself that attracts the flies? Should they be called *fruit* flies or something else?
- Some experiments could be designed using fruit fly larvae. Do larvae respond the same way that adults respond? Are there other factors that affect the choice?
- What is the difference among phototaxis, chemotaxis, and geotaxis? Do fruit flies demonstrate all of them?
- Does the age of the fruit fly change its geotactic response?
- Are there other organisms that respond the same as fruit flies? Are there other organisms that respond differently from fruit flies?

Choice Chamber

Step 1 Prepare a choice chamber by labeling both ends with a marker - one end "A" and the other "B".

If using plastic bottles - Cut the bottom of the bottles, dry the interior thoroughly, and tape them together. Remove any paper labels.



Place a cap on one end of a chamber before adding flies. Insert a small funnel in the open end of the chamber and tap 20-30 fruit flies into the choice chamber using the funnel.

Choice Chamber

Step 2 After the transfer, quickly cap the other end of the chamber.

Step 3 Begin your study by placing a few (5-10) drops of distilled water on two cotton balls, and adhere one moist cotton ball to each end of the chamber. Do not add too much water or any other chemical to the cotton; too much liquid will drip down into the chamber and affect the experiment by sticking flies to the bottle.

Step 4 Lay the chamber down on a white surface or on white paper.

Step 5 Give the flies at least 5 minutes of undisturbed time, and then count the number of flies at each end of the chamber. Create a table to record the number of flies you find at each end (A and B) of the chamber.

Choice Chamber

Step 6 Begin to test each factor you are including in your investigation. After exposing the flies to the test chemical/ factor, lay the chamber down on a light colored surface (or on white paper) and observe the flies.

Step 7 Give the flies at least 5 minutes of undisturbed time, and then count the number of flies at each end of the chamber.

Analyzing & Evaluating Results

Quantify your results and express them graphically.
Complete a chi-square analysis of your results.

Evaluation Questions:

- Is there anything that was shared by all of the environmental factors to which the flies were attracted?
- Is there any that was shared by all of the environmental factors to which the flies were repelled?
- How do you explain the behavior of fruit flies in someone's kitchen or in nature based on the information you collected? Do your data explain all fruit fly movements? Explain your answers.
